nuary 1948

# Chemical Industries

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**BASIC RESEARCH SPURS DRYING OIL PROGRESS**
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√R v.62 Jan.-June 1948

# THE FINEST ALKALIES

# BEAR THIS MARK

## SOLVAY PRODUCTS

TRADE MARK REG. U. S. PAT. OFF.

## FOR THE RAYON INDUSTRY

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Caustic Soda

Liquid Chlorine

Soda Ash

Sodium Nitrite

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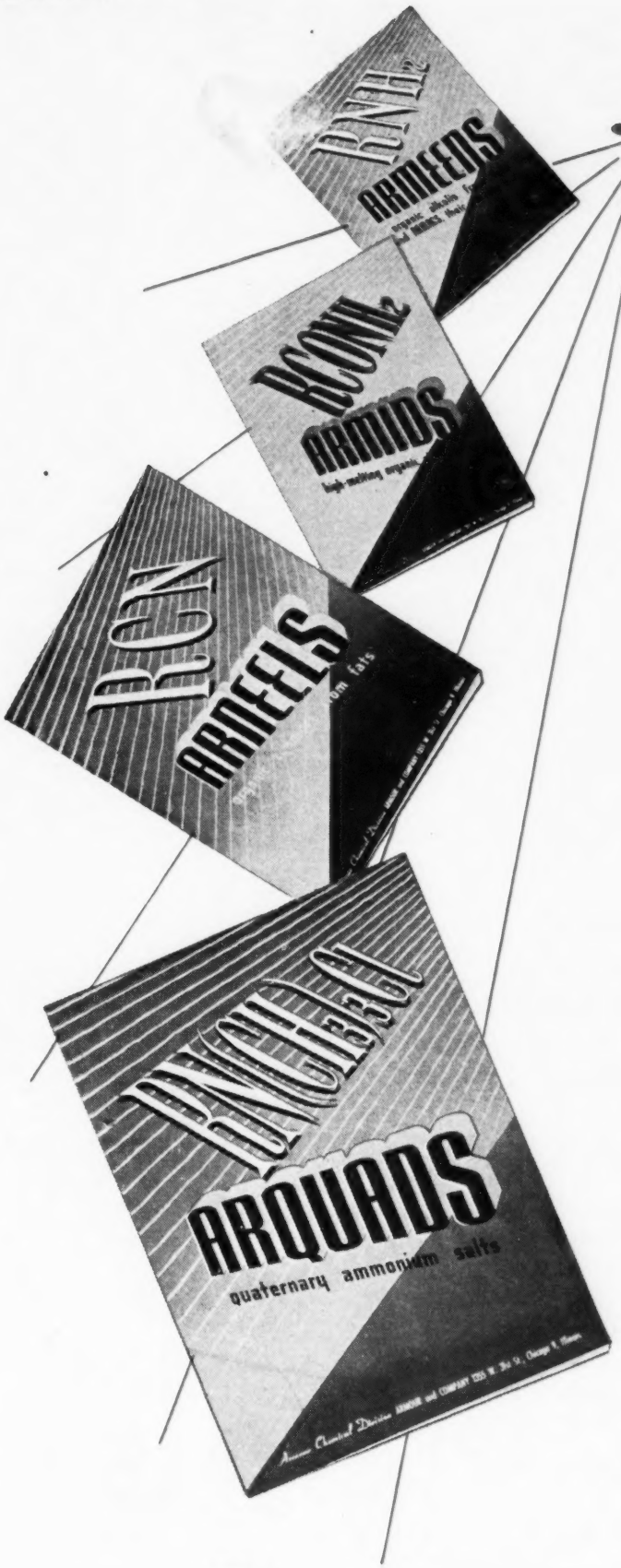


**AND NOW . . . THE**

# arquads

## ARMOUR'S QUATERNARY AMMONIUM SALTS

**Newest** of the Armour "Chemicals from Fats" are the ARQUADS—a group of alkyl trimethyl ammonium chloride compounds now available in quantity for industrial use.

**Current** commercial applications of the ARQUADS are numerous and diversified. Their full utility is yet to be determined.

**Among** the present uses are: as industrial germicides, fungicides, and disinfectants; alkaline cleaning compounds; water-treating chemicals; ore flotation reagents; anti-static polishes for plastics; cationic emulsifiers and detergents; textile softeners.

**In addition** to these ARQUADS, special types of quaternaries ranging from water-soluble to oil-soluble can be produced to meet your specific requirements.

**A new booklet** containing chemical and physical data on the ARQUADS and their uses is available upon request. The coupon below may also be used for requesting similar booklets on the ARMEENS (aliphatic amines), the ARMIDS (aliphatic amides), and the ARNEELS (aliphatic nitriles) if these booklets are not already in your files.

**MAIL THIS COUPON TODAY!**
*(attached to your business letterhead, please)*

Please send me booklets checked:

☐ Arquads ☐ Armeens ☐ Armids ☐ Arneels

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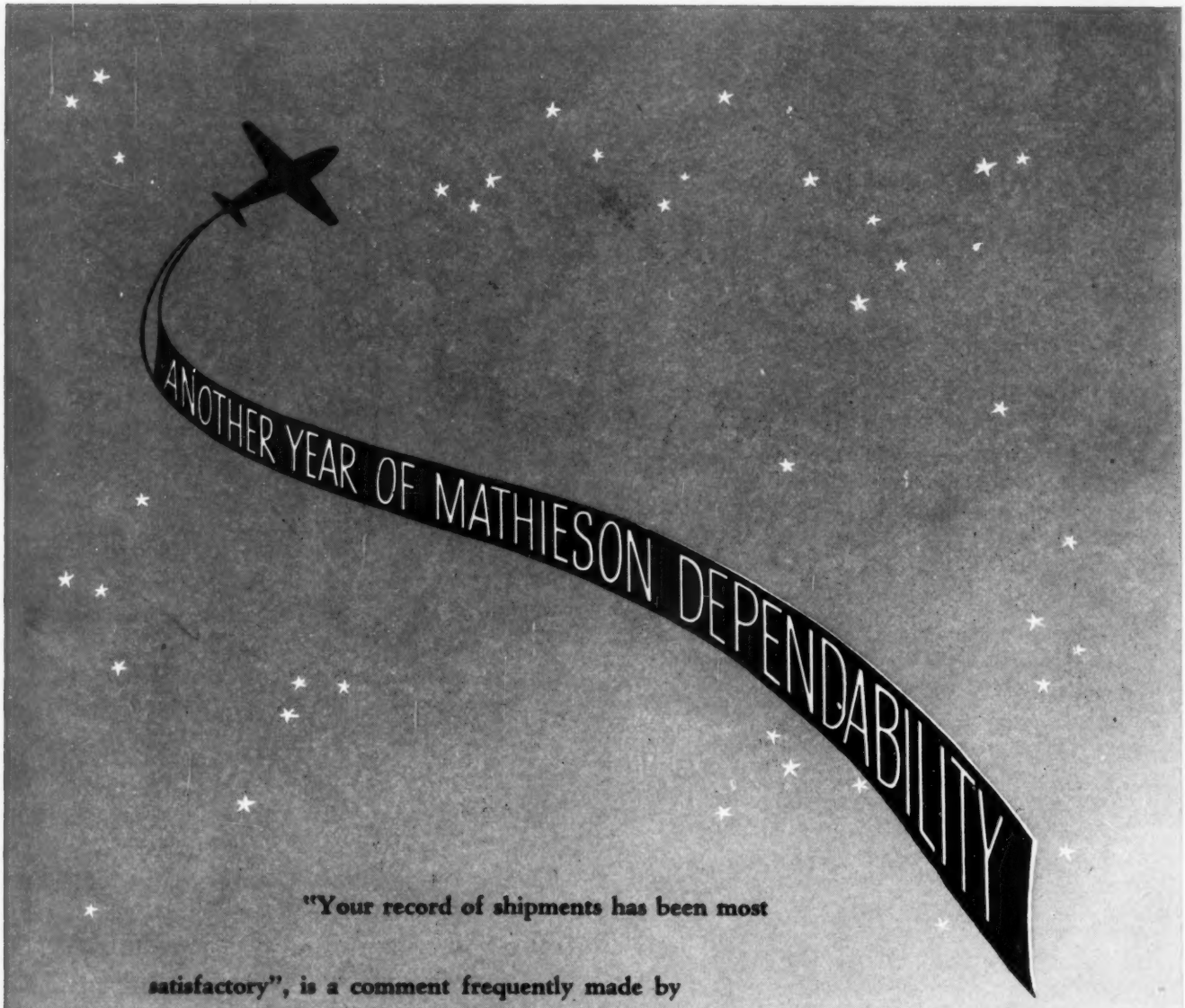


"Your record of shipments has been most satisfactory", is a comment frequently made by Mathieson customers. Every effort is being made to maintain this dependable service. For 1948, we are carefully matching contract commitments against our productive capacity to make every possible pound of material available to our customers.

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Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine . . . Chlorine Dioxide . . . Ammonia, Anhydrous & Aqua . . . HTH Products . . . Fused Alkali Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate.

# Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 62—NUMBER 1 **JANUARY, 1948**

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Tariff Revision
Sherwin-Williams Specialties
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*Cover: Courtesy Sherwin-Williams Co.*

*Illustrations pages 62 and 64, courtesy International Harvester Co.*

**PUBLICATION STAFF:** Editor, Robert L. Taylor; Managing Editor, W. Alec Jordan; Chemical Editor, Howard C. E. Johnson; Engineering Editor, Herman W. Zabel; Editorial Assistant, Barbara M. Bissell; Contributing Editors, T. P. Callahan, T. N. Sandifer, Nathan C. Rockwood; Production Manager, O. E. Vaream. **CONSULTING EDITORS:** Robert T. Baldwin, L. W. Bass, Benjamin T. Brooks, J. V. N. Dorr, Charles R. Downs, Ernest W. Reid, Norman A. Shepard. **BUSINESS STAFF:** Advertising Manager, L. Charles Todaro; New York, Wm. B. Hannum, Jr.; Chicago, Frank C. Mahnke, Jr.; Los Angeles, Don Harway; Circulation Manager, Florence Sanders.

Published monthly, except twice in November, at 1309 Noble St., Philadelphia 23, Pa., and entered as 2nd class matter July 15, 1944, at the Post Office at Philadelphia 4, Pa., under the Act of March 3, 1879. Subscription $5 a year, $8 for two years, $10 for 3 years. Add $2 per year for postage to Latin America. Other foreign rates, except Canada, $15 one year, $30 for 3 years. Single copies 60c, except special issues. Canadian subscriptions and remittances may be sent in Canadian funds to Chemical Industries, P. O. Box 100, Terminal A, Toronto, Canada.
Copyrighted 1947, by MACLEAN-HUNTER Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y., Murray Hill 2 7888. Horace T. Hunter, President; John R. Thompson, Vice President and Treasurer; J. L. Frazier, Secretary.
OFFICE OF PUBLICATION: 1309 Noble Street, Philadelphia 23, Pa. EDITORIAL & EXECUTIVE OFFICES: 522 Fifth Ave., New York 18, Murray Hill 2-7888. DISTRICT OFFICES: Chicago: 309 West Jackson Boulevard, Chicago 6, Ill., Harrison 7890. Los Angeles: 420 Halliburton Bldg., 1769 W. 8th St., Los Angeles 14, Calif., Mutual 8512. San Francisco: 68 Post St., San Francisco 4, Calif., Yukon 1069. London: Sun Life of Canada Bldg., Trafalgar Square, London, S. W. 1, England.

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* Trade mark.

# THE READER WRITES

## *Detergent Addenda*

*To the Editor of Chemical Industries:*

All of us who work with synthetic detergents are indebted to you for presenting the compilation presented in your November issue. It is a number of years since a similar compilation was published.

In order to improve the utility of the tabulation, we would like to request that you correct the references to our own products, as follows:

1. The use of the name Oronite Detergent was discontinued about nine months ago. The product previously so designated is now known as D-40.

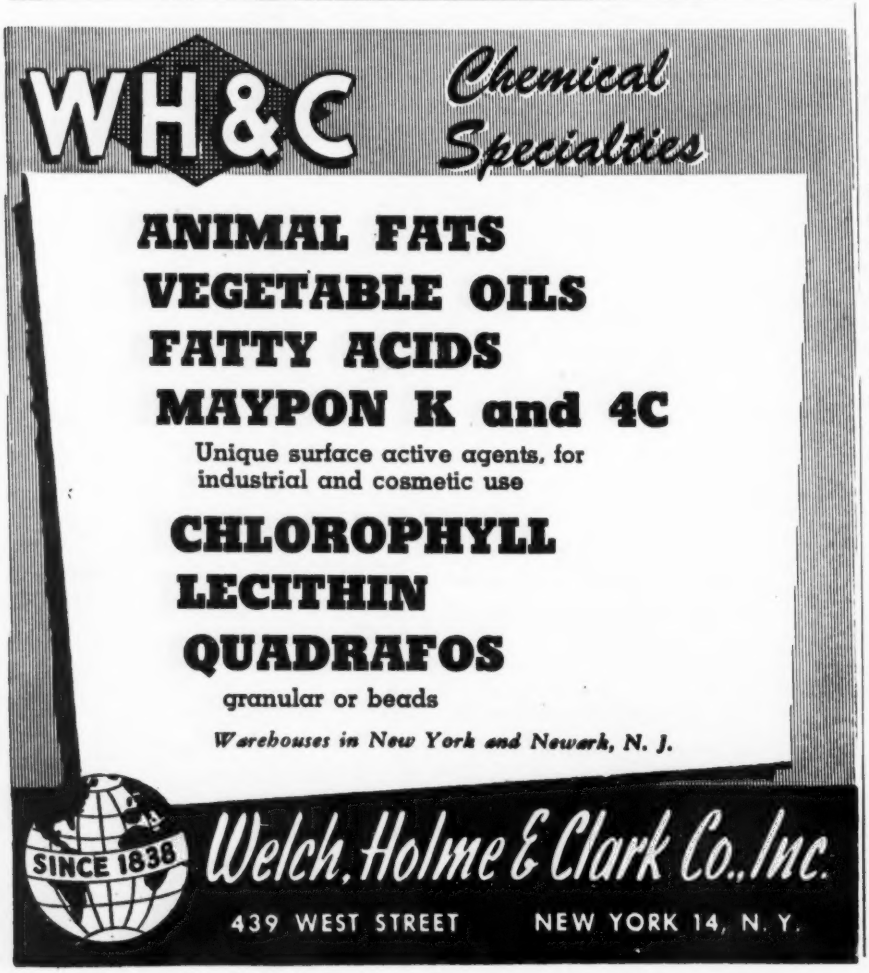
2. We also market synthetic detergents of the same alkly aromatic base, designated as D-60 and S-40.

3. The products listed as Oronite No. 3, etc. should be designated Oronite Sodium Sulfonate No. 3, etc. In addition to the numbered grades, we also offer Oronite Purified Sulfonates. These are all sulfonates recovered in the course of petroleum refining.

The accompanying tabulation presents current information regarding our products.

H. E. Bramston-Cook
Oronite Chemical Co.
New York, N. Y.

| *Trade Name* | *Class or Formula* | *Principal Uses* | *Approx. Concentration* | *Remarks* |
|---|---|---|---|---|
| D-40 | $R\text{-}C_6H_4SO_3Na$ | Detergent, Wetting | 40% | Detergent and wetting agent in acid, alkaline and neutral media. Produces stable foam. |
| D-60 | $R\text{-}C_6H_4SO_3Na$ | Detergent, Wetting | 60% | Same as D-40. |
| S-40 | $R\text{-}C_6H_4SO_3Na$ | Detergent, Wetting | 40% | Spray dried version of D-40 |
| Oronite Purified Sulfonate | Polyalkyl aryl sodium sulfonate | Emulsifying | | Cutting oils; leather and textiles; fat splitting; rust preventives. |
| Oronite Sodium Sulfonate No. 3 | Polyalkyl aryl sodium sulfonate | Wetting, Detergent | 75% | Textile cleaning; dye assistant in acid, alkali or neutral solution. |
| Oronite Sodium Sulfonate No. 4 | Polyalkyl aryl sodium sulfonate | Wetting, Dispersing | 30% | Metal cleaning; truck washing; agricultural sprays. |
| Oronite Sodium Sulfonate No. 5 | Polyalkyl aryl sodium sulfonate | Detergent, Emulsifying | 29% | Machinery cleaning; asphalt, wax and pine oil emulsions. |
| Oronite Sodium Sulfonate No. 6 | Polyalkyl aryl sodium sulfonate | Wetting; Detergent Assistant | 52% | Hard-water soaps; industrial cleaners; electroplating. |



## *Pallet Pool*

*To the Editor of Chemical Industries:*

The article in your September issue on "Handling Trends" by Norman L. Cahners interests us very much, especially the reference to the "Lawrence Pallet Pool."

Since we are unable to locate the address of the Lawrence Pallet Pool, we wonder if you would be kind enough to forward this information to us.

C. B. Matt
Plaskon Division
Libbey-Owens-Ford Glass Co.
Toledo, Ohio

*The Lawrence Pallet Exchange Co., which operates the Lawrence Pallet Pool, is located at 72 Wall St., New York, N.Y.*—Editor.

## *Wrong Maker*

*To the Editor of Chemical Industries:*

I would like to call your attention to an error which appeared on page 815 of the article on Synthetic Detergents in your November issue. In the last column of that page directly under the picture, reference is made to Areskap-100 and Areskap-50 as being members of the American Cyanamid series of compounds. This statement is not correct, since the Areskap trade mark is a Monsanto trade mark. This error does not appear to have been made in the index of synthetic detergents which appears on pages 817 to 824.

John H. Schneider
Monsanto-Chemical Co.
St. Louis, Missouri

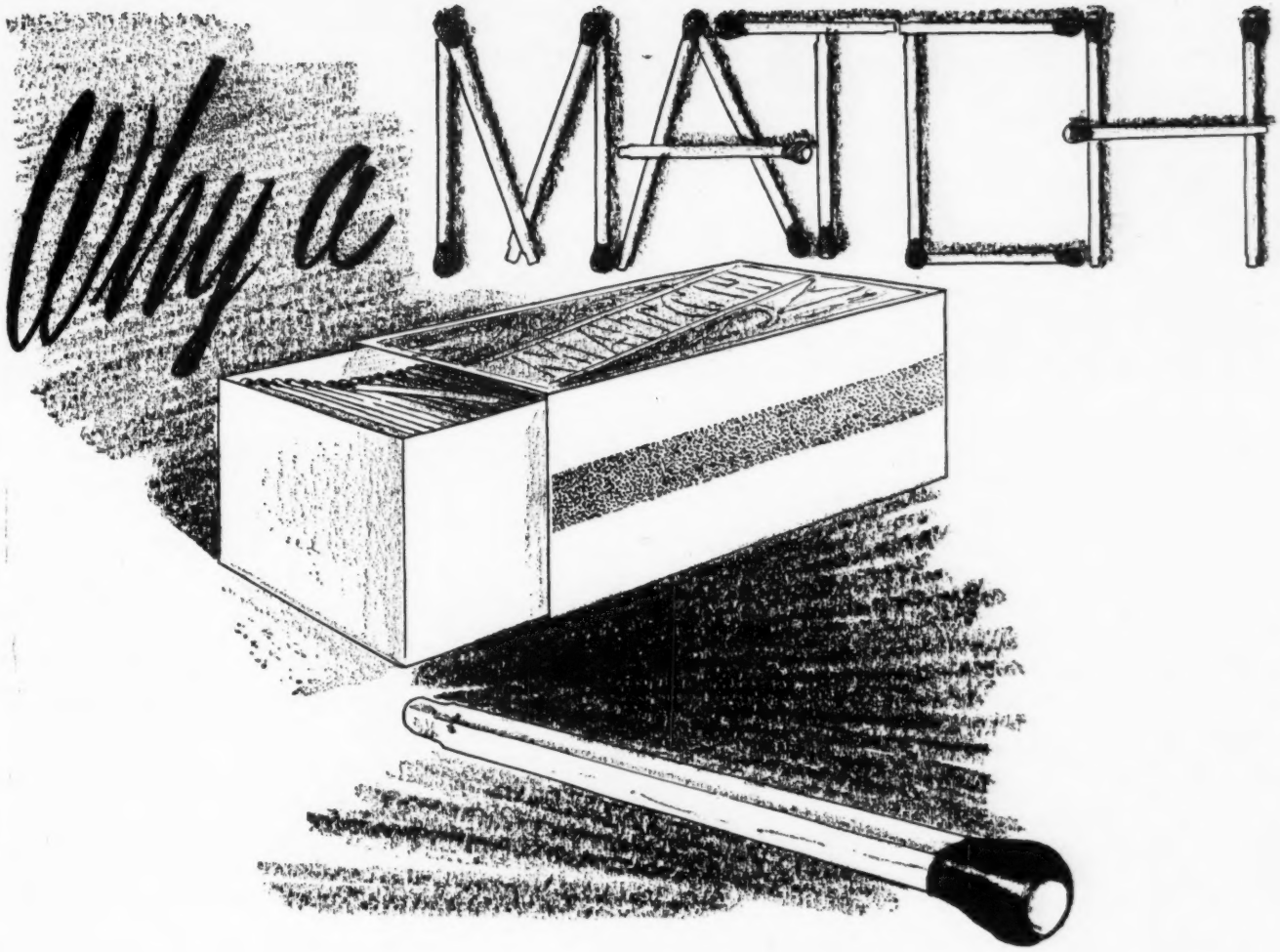
## *"Gammexane" Not Generic*

*To the Editor of Chemical Industries:*

In the past a certain amount of confusion has existed regarding the nomenclature of the insecticide benzene hexachloride or hexachlorocyclohexane. Considerable publicity has been given to the outstanding insecticidal properties of benzene hexachloride, and particularly the gamma isomer of benzene hexachloride under the name "Gammexane," since this word was coined and adopted by Imperial Chemical Industries Ltd., London, England, for use in connection with their new product following its introduction by them in February, 1945. We should like to point out that the name "Gammexane" has been registered over a large part of the world, including the United States, by Imperial Chemical Industries Ltd., London, England, as a trade name for the gamma isomer of benzene hexachloride and formulations containing this isomer.

The name "Gammexane" should therefore only be used to describe the appropriate products of Imperial Chemical Industries Ltd. and not as a generally descriptive term for benzene hexachloride or insecticidal compositions made therefrom.

R. M. Lewis
Imperial Chemical Industries (N.Y.) Ltd.
New York, N. Y.




The ordinary kitchen match, an item of every day use, is an example of one of the less known applications of Chromium Chemicals. Bichromate of Potash is important in the manufacture of matches even though the quantity involved is not large. Similarly, Chromium Chemicals find important applications in many other widely diversified branches of industry.

Twenty years ago the chief industrial use of Chromic Acid was for ornamental Chromium plating, but today it also has important applications in anodizing and etching aluminum, in treating magnesium and other metal finishing operations, and in an almost endless number of organic synthesis and other chemical processes requiring a strong oxidizing agent.

Interest in the use of Chromates to inhibit corrosion has increased greatly, and is still expanding. If the past is any indication, there are many more industrial problems in the solution of which Chromium Chemicals will play an important part. Mutual is planning for the future with that thought in mind.

**Bichromate of Soda • Neutral Chromate of Soda**
**Bichromate of Potash • Chromate of Potash**
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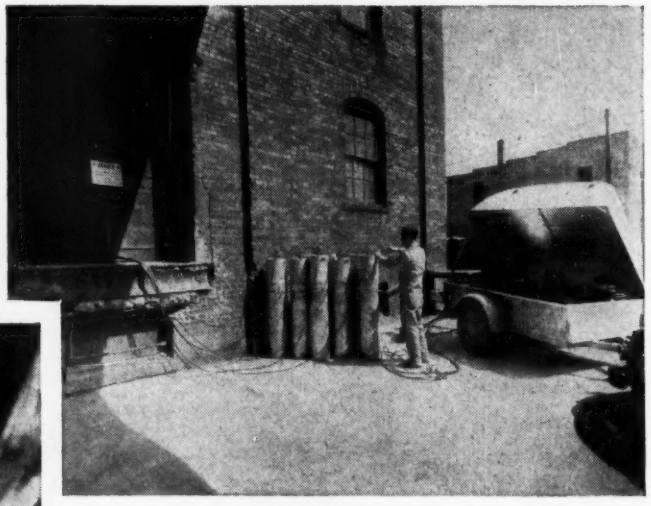
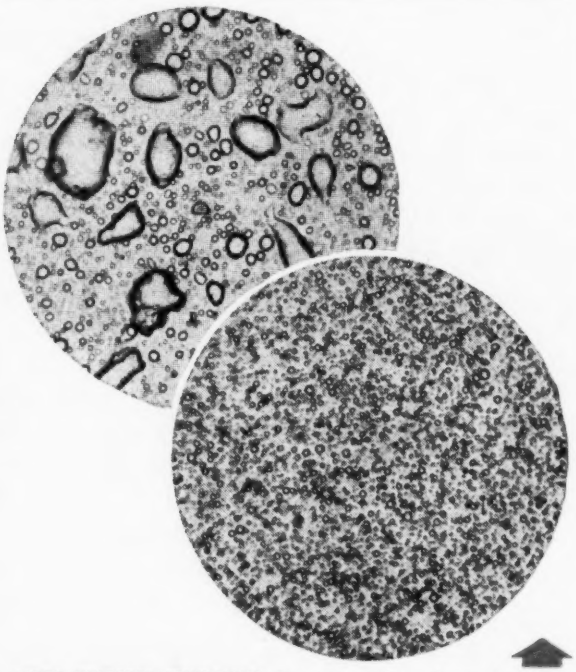
**CHROMIUM CHEMICALS**

# Life...on the

**DOUBLE PROTECTION** against pests in flour mills and food processing plants is provided by the joint use of Cyanamid's AERO* LIQUID HCN fumigant and ACRYLON* "spot" fumigant. AERO LIQUID HCN fumigant is the all-out fumigant for periodic plant-wide clean-ups. It penetrates all hiding places in mill and machinery, destroying rodents, insects and eggs wherever they are. ACRYLON fumigant, a volatile liquid, is ideal for more frequent spot fumigation. A few ounces poured into a machine gives quick pest-riddance with short exposures. Both assure maximum kill at minimum cost, leave no odor, taste or color and have no adverse effects on foods.

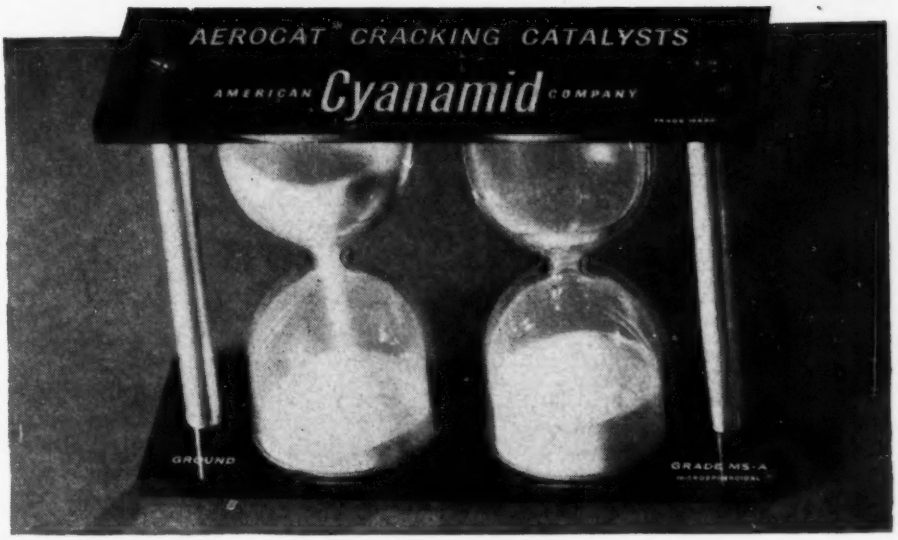




**MORE UNIFORM EMULSIONS** for cosmetics, drugs, paints, polishes, dyes and many other products are now being produced with demineralized water supplied at extremely low cost by Cyanamid's FILT-R-STIL* Demineralizers. Above are two microscopic photographs magnified 250 times. At left is a wax emulsion made with ordinary tap water. At right is same emulsion made with demineralized water, the low-cost chemical equivalent of distilled water. For full information write Ion Exchange Products Dept., American Cyanamid Company.

# Chemical Newsfront

**"CRACKING" CATALYSTS FLOW FASTER** and help to increase the efficiency of petroleum cracking when their minute particles are uniform microspheroids instead of ground particles of irregular shapes and sizes. Demonstrated by contrast in the hourglasses is the superior fluidity of Cyanamid's AEROCAT** Grade MS-A (Microspheroidal) Synthetic Fluid Cracking Catalyst. Comprising particles which are of a highly uniform, rounded shape, it offers special advantages including improved operations and lower catalyst losses. More complete data on request.



**LONG-LASTING BEAUTY AND SERVICEABILITY** are provided by this colorful and practically unbreakable tableware made of Cyanamid's MELMAC* molding compound. Simple and dignified in design, such tableware offers interesting possibilities for use in homes, restaurants, hotels, company dining rooms and other places where beauty and durability are important.

**THIS TIGER TAKES BEATING** from sun, wind and rain, as do all outdoor posters. Durability of these posters is due to modern paper-making skill in the use of basic chemicals such as aluminum sulfate, or "alum," which serves chiefly as a binder to fix other chemicals to the fibres of paper. Cyanamid has numerous strategically located alum plants, all with modern equipment and production controls to assure a product of the highest quality and uniformity.

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# A PRIMARY ALCOHOL *that's Different*

# TETRAHYDROFURFURYL ALCOHOL (THFA)

**AS A REACTANT:**

Tetrahydrofurfuryl alcohol (THFA) differs from many other primary alcohols because of its ring structure and the reactions which it undergoes involving the ring. Typical examples of these are:

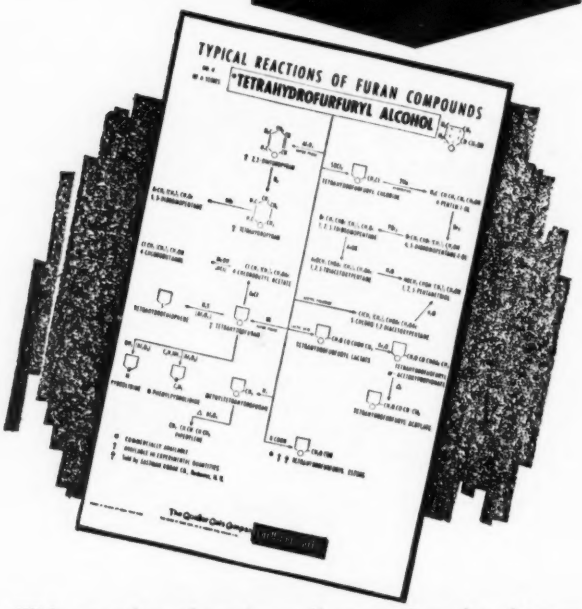
1. Ring expansion with formation of dihydropyran.
2. Substitution of the nuclear oxygen atom with the formation of pyrrolidines and tetrahydrothiophenes.
3. Ring opening with formation of open chain compounds.

In addition THFA undergoes many of the usual reactions of a primary alcohol and is assuming increased importance as a chemical intermediate in the preparation of high boiling esters, ethers and other derivatives.

**AS A SOLVENT:**

THFA differs from many other primary alcohols in its high boiling point (pure—177.5°C at 743 mm.) combined with complete water miscibility. This characteristic may be of value where reaction with water soluble materials is to be carried out at high temperatures. THFA is a solvent for chlorinated rubber, nitrocellulose, ethylcellulose, cellulose acetate, ester gum, rosin, shellac, many resins and other complex organic materials.

In view of its versatility we suggest that you may be able to use THFA to direct or extend your work with primary alcohols. Our Technical Staff will help on the application of THFA to your requirements.




This reaction chart in wall mounting size (approximately 18" x 24") or file size (8½" x 11") will be sent when requested on your business letterhead. When making request please state size desired. Ask also for Technical Bulletin 87A which gives physical and chemical properties, uses, shipping information and other valuable data.

**TETRAHYDROFURFURYL ALCOHOL (THFA)**
**$C_4H_7O\text{-}CH_2OH$**

| | |
|---|---|
| A limpid liquid with a mild odor | |
| Molecular Weight | 102.13 |
| Boiling Point (pure) °C (743mm) | 177.5 |
| Specific Gravity (20/20°C) | 1.064 |
| Flash Point (open cup) °C | 75-80 |
| Refractive Index (n 20/D) | 1.4505 |
| Surface Tension 25°C (Dynes/cm) | 36.5 ± 0.5 |
| Viscosity at 25°C (Centipoises) | 5.49 |

**The Quaker Oats Company** — CHEMICALS DEPT.

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EASTERN SALES OFFICE, 1232 WHITEHALL BLDG., 17 BATTERY PLACE, N.Y. 4, N.Y.

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In Australia, Swift & Company, Pty. Ltd., Sydney

FURFURAL • FURFURYL ALCOHOL (FA) • FUROIC ACID • TETRAHYDROFURFURYL ALCOHOL (THFA)

# *Synthetic*
# DETERGENTS
## FOR ALL INDUSTRIES

**ULTRA** *Chemical* **WORKS**

### ULTRAPONE-S

This is a new, slightly alkaline organic surface active agent, which lends itself to a multitude of applications in textile and cosmetic trades as well as for household cleaning detergents.

**PROPERTIES:**

- 100% active
- Clear, soluble in water in all proportions
- Active in extremely low concentrations
- Forms Viscous solution in dilutions as low as 10%
- Compatible with soap, most sulphated oils, sulphated or sulphonated synthetic detergents
- Non irritating
- Rich foaming
- Has excellent dispersing qualities
- Acid, alkali and lime stable
- pH 8.8
- Emolient
- Has excellent detergency

### SPRAY DRYING

**Our extensive spray-drying facilities enable us to custom-spray dry detergents ranging from 10% to 60% organic actives. Choose the types most useful to your operation.**

**Our wide range of detergents are available in consumer form: household detergents, rug shampoo, bubble bath, powder shampoo, and car wash.**

**Complete packaging facilities for private brand products are also available.**

### SULFRAMIN DT POWDER OR PASTE

The low-priced versatile detergent.

**PROPERTIES:**

- Alkyl amido alcohol sulphate
- High resistance to hard water
- Unaffected by alkali, acids, or lime
- Freely soluble
- Forms no precipitate
- Produces rich liquors in dilutions as high as 1 to 10,000

**OTHER ULTRA DETERGENTS**

- **Sulframin L W (Powder)**
- **Sulframin A B W (Powder)**
- **Sulframin DH (Paste)**
- **Sulframin D R (Liquid)**
- **Sulframin D R B (Liquid)**
- **Sulframin N (Paste)**
- **Ultrapone L R (non-ionic)**

## ULTRA CHEMICAL WORKS, Inc.

**PATERSON, NEW JERSEY** **CHICAGO, ILLINOIS**

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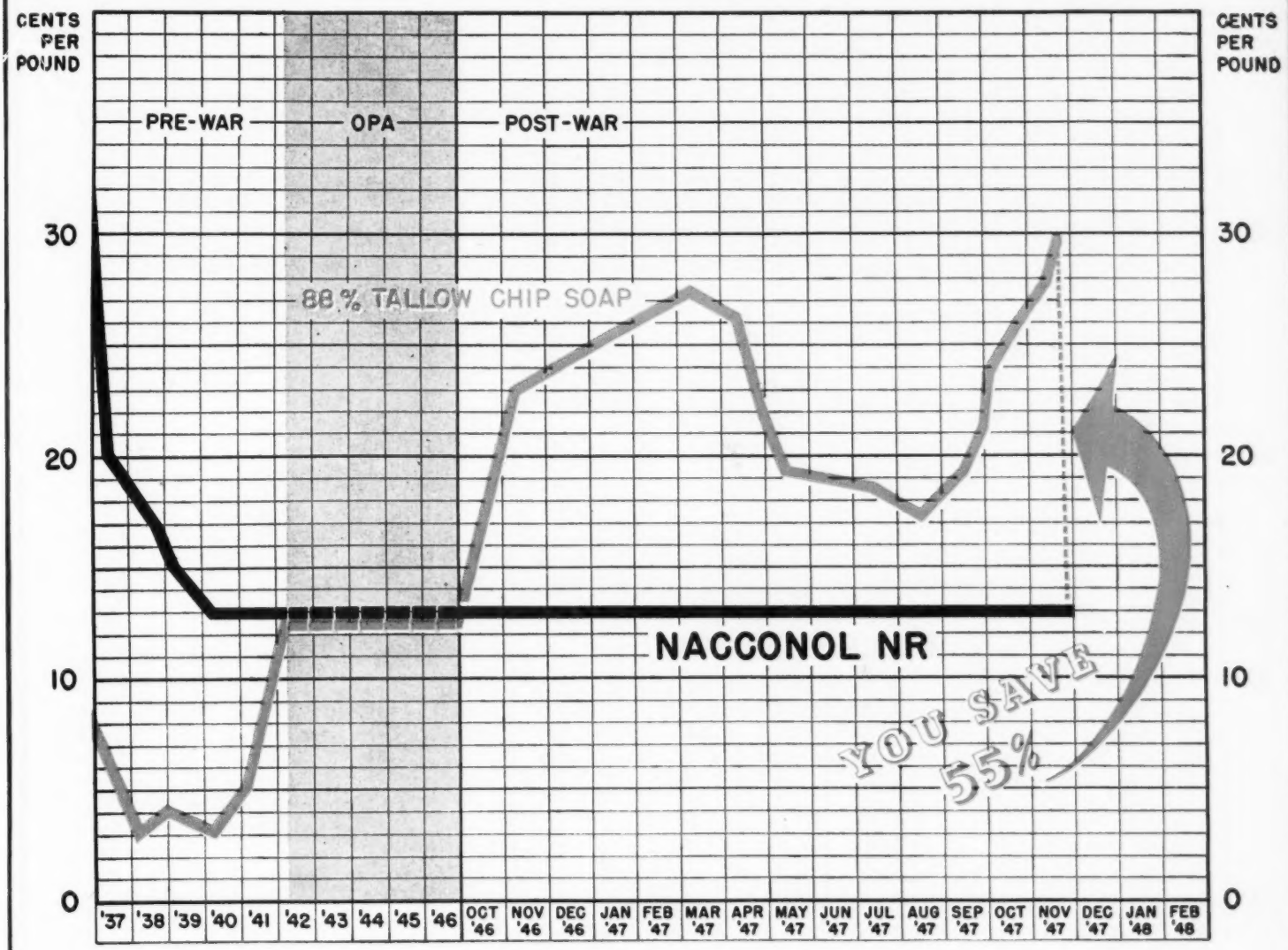
# *Pictures Speak Louder Than Words*

## COST COMPARISON - NACCONOL NR vs SOAP


CENTS PER POUND
CENTS PER POUND
PRE-WAR
OPA
POST-WAR
30
20
10
0
88% TALLOW CHIP SOAP
NACCONOL NR
YOU SAVE 55%
'37 '38 '39 '40 '41 '42 '43 '44 '45 '46
OCT '46 NOV '46 DEC '46 JAN '47 FEB '47 MAR '47 APR '47 MAY '47 JUN '47 JUL '47 AUG '47 SEP '47 OCT '47 NOV '47 DEC '47 JAN '48 FEB '48

*Adopt* **NACCONOL* NR**
*and cut your soap costs*

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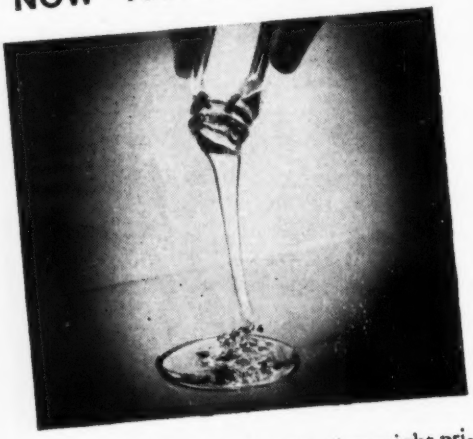
HOW HERCULES

# Creative Chemistry

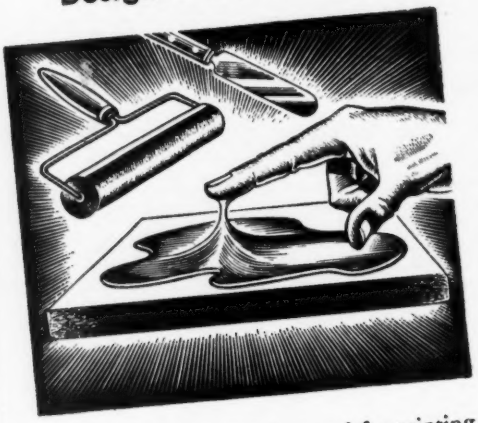
## HELPS THE PROCESS INDUSTRIES

### NOW—Alcohol from Rosin!



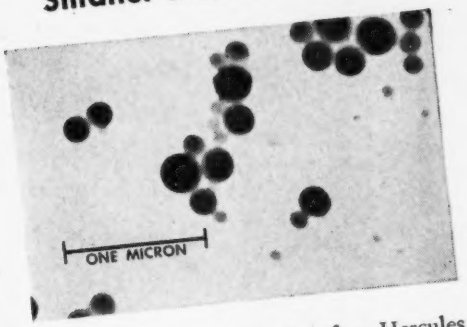
A new low-cost, high-molecular weight primary alcohol is the latest in a series of products developed from more than a quarter of a century of Hercules research in rosin chemistry. Called hydroabietyl alcohol, this new product is the most light-stable material ever produced from rosin. It is subject to the same chemical reactions as other primary alcohols, and can be used without further reaction as a modifier for chlorinated rubber, polyamides, hydrogenated oils, textile sizes, rubber compositions, and essential oil vehicles. Samples of this promising new industrial alcohol are available upon request.

### Designed for Printing



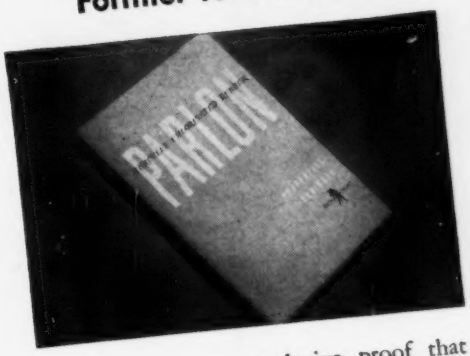
One of the new resins designed for printing inks, Hercules Pentalyn® 802A Pale incorporates properties suggested by prominent technical authorities of the ink industry. This phenolic-modified pentaerythritol rosin ester is noted for its uniformity, its paleness of color, and its controlled oleoresinous viscosity. Overprint varnishes and gloss inks made with this resin exhibit marked superiority in stability, gloss, and hold-out properties. Unlike many other custom-made resins, this product of Hercules research costs no more than general-purpose resins.

## Smaller than a Micron!




This electron micrograph of a Hercules Dresinol® illustrates the fine dispersion of the 40-45 per cent solids emulsions. Ninety per cent of the mass has been reduced to particles *smaller than a micron!* Low-cost Dresinols are sodium hydroxide and ammonium hydroxide dispersions of modified rosins and special resin acids. Combined with animal glue, starches, dextrin, proteins, natural and synthetic rubber latices, etc., they improve penetration, wetting, and adhesion to polar surfaces. They are useful in laminating, heat-sealing, and wet-type adhesives; emulsions paints; coatings and sizings.

## Fortifier for Alkyds




Recent tests give conclusive proof that Parlon® — Hercules chlorinated rubber — fortifies alkyd enamels . . . speeds drying time of air-drying as well as force-dry and baking types. Typical test results show that an all-alkyd enamel dried tack-free in 6 hrs. and 30 mins., while a formulation containing one part Parlon to three parts alkyd, dried tack-free in only 1 hr. and 20 mins. Low-cost Parlon-fortified finishes have been used successfully for trucks and buses, washing machine parts, air conditioning and refrigeration equipment, farm equipment, and machine tools. The book illustrated tells you how to cut the cost and improve the performance of your enamels and other finishes.

## A Good Low-Cost Resin!

Few resins on today's market offer the economy *and* the versatile properties of Hercules Vinsol®.

Could you use a dark, thermoplastic resin?

Do you want a resin with a high melting point?

Are you interested in a good resin that sells at only six cents a pound (in carload lots)?

It will pay you to investigate Vinsol—you'll be interested to learn the many useful properties of this unique resin—another product of Hercules creative chemistry.

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# ONYX IONICS

January — Newsworthy Items for Technologists and Production Men — 1948

## New High Molecular Quaternary Ammonium Bromide

Onyx Isonols are cation-active, high molecular dialkyl dimethyl ammonium bromides, with considerable promise for use in many industrial operations. They are soluble in oils and most common organic solvents. They are insoluble in water, but are instantaneously soluble in water and isopropyl alcohol (4:1). Compatible with acids (above pH 6) and with alkalies (below pH 10). They are precipitated and inactivated by anionic materials such as soaps and sulfonated oils.

Possessing the high germicidal and fungicidal properties inherent in quaternaries, these materials provide excellent penetrating, wetting and emulsifying action.

The Isonols can be used for emulsification of mineral and vegetable oils, and are of particular interest where their germicidal and fungicidal properties are of value in such emulsions. Cutting oils are readily preserved by any of the Isonols.

Samples of the Isonols will be gladly furnished for test purposes if you will let us know what applications you have in mind.

## One Never Knows . . .

Given properties which look promising for a specific application, you never can tell whether or not an industrial chemical will actually fulfil that promise until it is tried.

Onyx policy has always been one of extreme liberality in the furnishing of samples for trial in whatever quantities are called for by the nature of the application and the scope of the test or tests involved.

On this page we have covered seven Onyx products, each of which should be of specific interest to many industries not only for indicated applications but for potential uses which will be suggested to the reader by the properties outlined. If you think that one or all of these products might help you improve any of your own products or operations, or if you see a promise of interesting new products or operations which may be possible through the use of any of these Onyx materials, please feel free to ask for samples. Just let us know just what use you plan to make of them, in order that we can be sure to send an adequate sample and cooperate with you in furnishing whatever information we have that bears on the use or uses you have in mind.

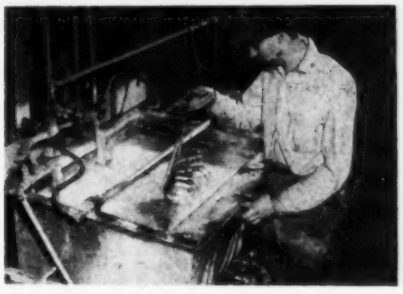
# Unique Anionic Assistant for Acid Detergent and Dispersing Operations

Onyx NSAE Powder is an anionic wetting agent with the interesting property of stability in mineral and organic acid solutions. It has been successfully used in 4% $H_2SO_4$. It provides speedy wetting action in relatively concentrated solutions – 5 seconds, Draves Test, at 25°C. and at 0.5% concentration.

This sodium salt of an alkylnaphthalene sulfonic acid combines in one compound the action of an emulsifier, penetrant and dispersing agent. It has adequate foaming and suspending effect for many industrial purposes. It does not form insoluble metallic soaps, and is compatible with hard water up to 125 ppm.

NSAE Powder provides a high concentration of active ingredient at a moderately low cost. It has many possible uses beyond those suggested below:

Assistant for providing wetting and dispersing action in cleaning metal parts and products prior to plating and other finishing operations; in pickling work; in electroplating solutions.



*NSAE Powder provides improved wetting and penetrating action in the acid solutions used for pickling and electroplating.*

Improving solutions for washing of fruits and vegetables through added dispersing and penetrating action plus faster, more thorough rinsing.

Providing better spreading and dispersing effects in insecticides and fungicides.

Conditioning paper mill felts, for breaking in new felts and reconditioning loaded felts. (Used here in solution without other materials.)

It is quite possible that the properties indicated above will suggest other possible uses for NSAE Powder in one or more operations in your plant – or in one or more of the products you manufacture. We are anxious not only to discuss these possible uses with you, but to send an adequate sample for tests in your plant, or in the field to determine whether or not NSAE Powder will prove profitable or useful to you. Please feel free to call on Onyx for samples as well as consultation on possible applications. Onyx Technical Bulletin IND.-2 covers this product in detail. Ask for as many copies as you can use.

## NEW DEVELOPMENTS

*For Further Details Write Onyx*

***New Cationic Germicides for Effective Algae Control*** in swimming pools, air conditioning installations, cooling systems, etc. The Ammonyxides, non-toxic in use-dilution, insure effective control with very low concentrations. No. 13

•

***Unusual Foaming Detergent for Rug and Carpet Cleaning Compounds.*** Maprofix NEU is an anionic surface-active material with uniquely high volume of persistent lather. Effective not only for carpet and rug cleaning, but for bottle washing and metal cleaning compounds. No. 14

•

***For Removal of Oily Grease and Dirt from Machinery and Metal Parts.*** Neutronyx 330 or 834, used with organic solvents, makes a very useful emulsifiable cleaner. Such cleaners are sprayed on greasy, oily surfaces, allowed to soak in, and are then flushed off with water. No. 15

•

***Improved Washing of Vegetables and Fruits*** is obtained from cleaning compounds containing NSAE Powder, due to the better wetting and dispersing effects it provides. No. 16

## Onyx Cationic Germicide for Sanitizing Operations

Onyx BTC is a 50% concentrate of an alkyl dimethyl benzyl ammonium chloride which is one of the most effective bactericides and fungicides now available, with the highly important advantage of non-toxicity in all use-dilutions for sanitization purposes.

If you are interested in non-selective bactericidal and bacteriostatic action at high dilutions, with accompanying deodorizing action on any sanitizing operations, ask for complete data and samples for test.

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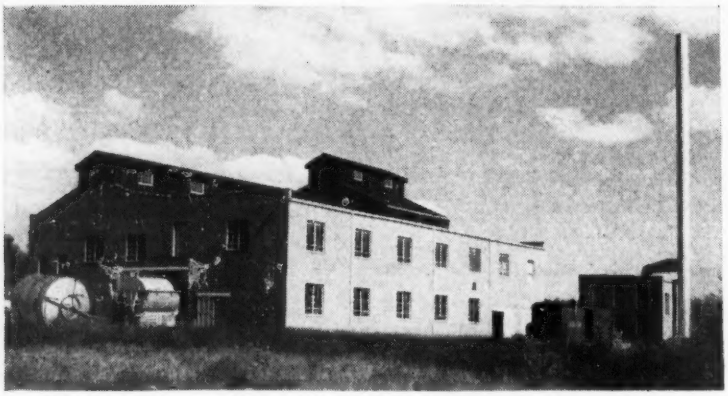
# MODERN NEW MANUFACTURING PLANT JEFFERSON CITY, MISSOURI



## For SALE or LEASE

If you are considering plant expansion, this property can save you many months of construction delay and expense and can enable you to get into profitable production quickly.

Built by private interests and designed for a wet-milling operation, this plant, in the heart of industrial Missouri, is available for sale or lease. The plant in its present state of completion is readily adaptable to many types of manufacture.

### PLANT INFORMATION:

The plant is 141' long by 91' wide. A mezzanine 38' 6" wide runs the length of the building. The plant covers an area of 17,780 square feet. Facilities include: Two-car railroad loading dock, truck loading entrances, offices, lavatories and a research laboratory. Installed power generating equipment has a capacity of 800 KVA. Plant site, 15 acres.

### LOCATION:

In Jefferson City, the Capital of Missouri, midway between St. Louis and Kansas City.

### TRANSPORTATION:

The Missouri Pacific Railroad and The Kansas & Texas Railways.

**Write, wire or phone J. P. Margeson, Jr., Executive Vice President, for illustrated folder and more detailed information.**

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# KELCO ALGIN

## *Plays Many Parts*

● In the drama of American industry, versatile Kelco Algin plays many and varied roles.

It is a sure-fire hit in such diversified assignments as stabilizer for ice cream — stabilizer and emulsifier for pharmaceuticals — sizing for paperboard — suspending agent for chocolate milk — bodying and suspending medium for cold water paints — thickening agent for textile printing pastes . . . plus numerous other commercial applications where there's need for a superior stabilizing agent.

Kelco Algin is a product of nature, free of impurities, and processed to exacting standards that assure complete uniformity, balance and stability. Non-variable, yet readily adjustable to critical changes of environment.

Moreover, you will find it is surprisingly economical. We will be pleased to send you complete information as to the part it can play in meeting your specific requirements.

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# FOR YOUR INFORMATION

## SPOTLIGHT ON A QUESTION

How and where can you use HB-40—Monsanto's clear, mobile, high-boiling hydrocarbon? These quick facts may help you.

HB-40 is of interest as a plasticizer or as an extender for primary plasticizers used in polyvinyl, ethyl cellulose and polystyrene plastics, as well as chlorinated-rubber compounds.

HB-40 is also of value as a plasticizer for asphalt-base and Gilsonite-base paints.

HB-40 is a non-volatile solvent for various types of oils, resins, waxes, rubber and asphalt. As a constituent of fast drying alkyd enamel, it imparts flow and gloss and acts as an anti-skinning agent.

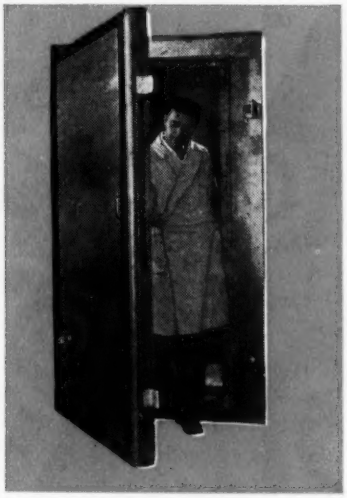
HB-40 also possesses good electrical properties—high resistivity and a low power factor, making it of interest where selected plasticizers are used in the electrical field.

If you are interested in any of these applications—or if they suggest new and other uses to you—you will find complete interesting information in Monsanto's Technical Bulletin P-104. Write to MONSANTO CHEMICAL COMPANY, Phosphate Division, 1703 South Second Street, St. Louis 4, Missouri, or return the coupon if you prefer.

### Basic Improvement in Worsted Spinning

More uniform yarn results from the addition of Monsanto's Syton* W-20 to the spinning emulsion. Distributed evenly throughout the stock, Syton increases interfibre friction and thereby reduces the tendency of individual fibres to slide by one another . . . For full technical information get in touch with MONSANTO CHEMICAL COMPANY, Merrimac Division, Boston 49, Mass., or use the convenient coupon.

*Reg. U. S. Pat. Off.*



### Do You Use or Make Insulated Equipment?

These new, all-metal refrigerator doors insulated with Santocel,* Monsanto's unique silica aerogel, are less than half the thickness, half the weight, of doors containing previously preferred insulating materials. Their overall thickness of 3⅛" furnishes cold protection equal to that of an old-fashioned door 8" thick. Reduced weight and less bulk means easier handling, more space, simplified construction, longer life, lower maintenance costs.

Get complete Santocel information and technical data valuable to you from: MONSANTO CHEMICAL COMPANY, Merrimac Division, Boston 49, Mass. Use the coupon if you prefer.

*(Santocel-insulated door manufactured by Refrigerator Doors, Inc., Mt. Kisco, N. Y.)*

# News of Monsanto Chemicals for the Process Industries.....January, 1948

Of special interest to the entire plastics industry is this new development of Monsanto Chemical Company—Santicizer 160 . . . It is a heat-stable plasticizer that offers many advantages in production operations, as well as important product improvements.

Since it is compatible with a large variety of more generally used resins—including the important vinyl polymers and co-polymers, nitrocellulose and ethyl cellulose—Santicizer 160 can be applied to a broad range of different products having varying degrees of hardness and flexibility.

Probably one of the chief advantages of Santicizer 160 is that it permits plastics manufacturers to increase their production rate. For instance, its use enables the extrusion of plastic products *faster* at temperatures normally employed . . . or, existing production rates can be maintained *at lower temperatures.*

In addition to its outstanding economy and wide compatibility, Santicizer 160 is characterized by a low burning rate, low-temperature flexibility, oil resistance, heat stability, light stability and abrasion resistance. For complete technical information write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, St. Louis 4, Missouri, or use the convenient coupon.

*Santicizer: Reg. U. S. Pat. Off.*

**NIFOS-T**
**Improved Monsanto Insecticide**

Nifos-T — recently announced by Monsanto — contains approximately 40% tetraethyl pyrophosphate. It is available in commercial quantities—at a price that will allow lower cost control of insects and mites . . . Bio-assays have shown that Nifos-T possesses 3 times the biological activity of hexaethyl tetraphosphate, formerly sold as Nifos. Inquiries are invited concerning prices and technical information.

**MONSANTO INTERMEDIATES**

This partial list is representative of the large variety of Monsanto intermediates serving industry. Write for further information on your particular needs, or mail the convenient coupon.

Thiourea
Toluenesulfonic Acid, 94%
Dinitrochlorobenzene
ortho-Aminobiphenyl, Technical
Benzoic Acid, Technical
Benzyl Chloride
ortho-Chlorophenol
para-Chlorophenol
Cyclohexylamine
2,4 Dichlorophenol, Technical
Dicyclohexylamine
2,4 Dinitroaniline
ortho-Nitrobiphenyl, Technical
Phenol, U.S.P.
Phosphorus Oxychloride
Phosphorus Trichloride
Sodium Benzoate, Technical

MONSANTO
CHEMICALS for PLASTICS

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MONSANTO CHEMICAL COMPANY, 1703 South Second Street, St. Louis 4, Missouri,
**District Sales Offices:** New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle.
In Canada: Monsanto (Canada) Limited, Montreal.

MONSANTO CHEMICAL COMPANY
1703 South Second Street, St. Louis 4, Missouri
I would like further information and technical data on the following Monsanto products_____

_____

*Name*_____ *Title*_____
*Company*_____
*Address*_____
*City*_____ *State*_____

# If you can catch a leprechaun...

**A leprechaun,** according to Irish legend, is a dwarf who keeps a pot of gold hidden away.

If you can catch a leprechaun, your troubles are over.

Because he keeps his gold just for ransom money. If you catch him, he'll quickly tell you where his gold is, so you let him go.

The best place to look for a leprechaun is in the woods. They're green, and only about nine inches tall, so you'll have to—

Or maybe you don't believe in leprechauns.

Maybe it would be more practical to just keep working for your money. But you can learn one good lesson from these little fellows. A small pot of gold put to one side is a great help when trouble catches *you*.

And there's a much faster and easier way to get your pot of gold than by catching leprechauns. You can buy U. S. Savings Bonds through an *automatic* purchase plan.

**If you're employed** you can sign up for the Payroll Savings Plan. If you have a bank account you can sign up for the Bond-A-Month Plan. Either way, your pot of gold just saves itself, painlessly and automatically.

And your money increases one third every ten years. That would make a leprechaun turn even greener with envy.

## Save the easy, automatic way—with U.S. Savings Bonds

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# *Wherever Chemical Quality Counts...*

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# *Confidentially, your best bet is Hardesty*

It's no secret in the industry that Hardesty delivers the goods. We do not perform miracles but many times our knowledge and experience in fatty acids can help solve the most knotty production problems.

Hardesty products are made in various grades to meet the requirements of the chemical, textile, cosmetic, soap, rubber and other industries. Why not get acquainted with the Hardesty way of doing business now? You'll like our personalized service and we can show you with information and samples why it pays to keep in touch with Hardesty.

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# NEVILLE SHINGLE STAIN OILS AND CREOSOTE OILS

*If you manufacture or are interested in the production of Shingle and other Wood Stains, it will be to your advantage to investigate low-cost Neville Shingle Stain Oils and Creosote Oils.*

## *2-AN Light Stain Oil*
## *LX-77 Shingle Stain Oil*

Excellent vehicles for pigmented light colored shingle stains (the 2-AN is the palest). Also for thinning low-cost high-baking japans.

## *#1 Creosote Oil*

Meets American Wood-Preservers' Association No. 1 specifications.

## *Nevasota*

Specially refined creosote. It is suitable for brush and spray work as it contains no crystals above 4° C. Meets American Wood-Preservers' Association No. 24f specifications.

A-27

# THE NEVILLE COMPANY

**PITTSBURGH 25, PA.**

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RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

# TORTURE IS HIS BUSINESS

Before a resin has the right to bear the U.S.I. trademark, it goes through days of the kind of torture only modern science can devise. He sees to that.

He's a U.S.I. test chemist, of course. Under his hands, U.S.I. resin films are baked by the light of artificial suns . . . flooded by torrential rains . . . tugged and strained by rapid temperature changes . . . crushed in the steel jaws of a mandrel.

When he's through with them, he's sure they'll stand up in any paint, varnish, or lacquer they're designed for . . . no matter how tough the service conditions. And it's this insistence on hypercritical control that's the key to U.S.I. quality.

*For Natural and Synthetic Resins —Keep Your Eye on U. S. I.*

**SYNTHETIC RESINS**

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| **ESTER GUMS** | *all types* |
| **CONGO GUMS** | *fused and esterified* |
| ***AROPLAZ** | *alkyd and allied materials* |
| ***AROFENE** | *pure phenolics* |
| ***AROCHEM** | *modified types* |

**NATURAL RESINS**

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|---|---|
| **PALE EAST INDIA** | **MANILA (Alcohol-Soluble)** |
| **BATU** | **ELEMI** |
| **BLACK EAST INDIA** | **RED GUM** |
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***60 East 42nd Street, New York 17, N. Y.***

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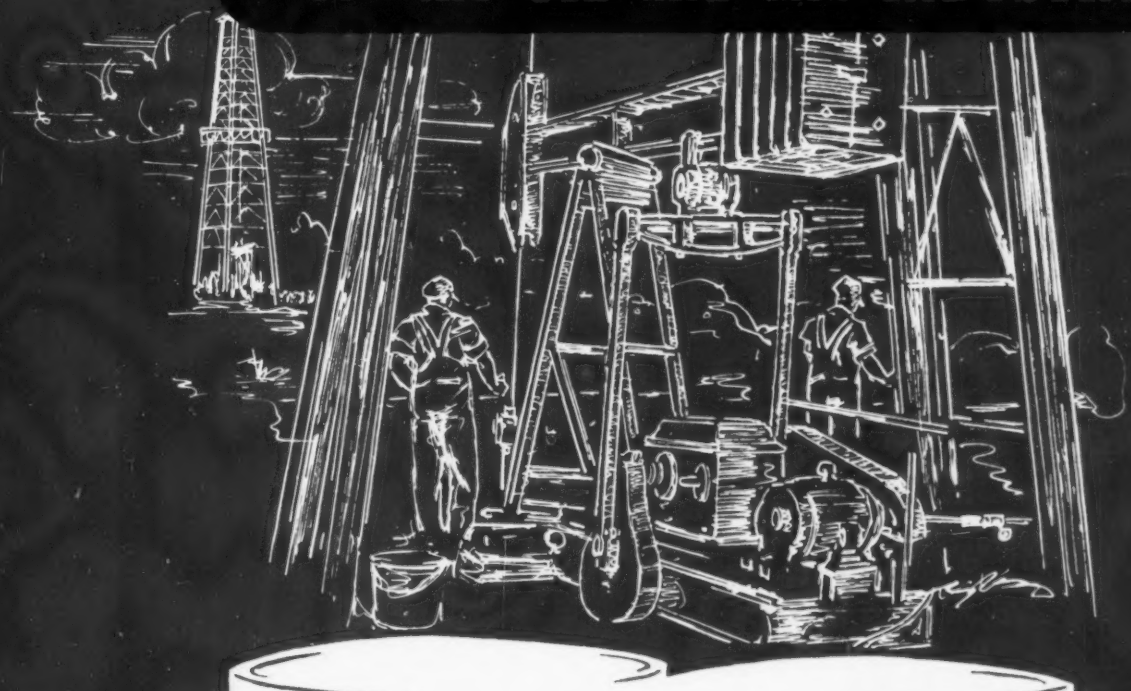
## for the OIL and GAS INDUSTRY



Whether it's muriatic acid to increase the productivity of oil wells, aluminum chloride as a catalyst in petroleum-cracking, or other industrial chemicals used in the petroleum industry, you can depend on Stauffer for quality chemicals in any quantity. Investigate Stauffer's facilities as a dependable source of supply on your industrial and agricultural chemical needs.

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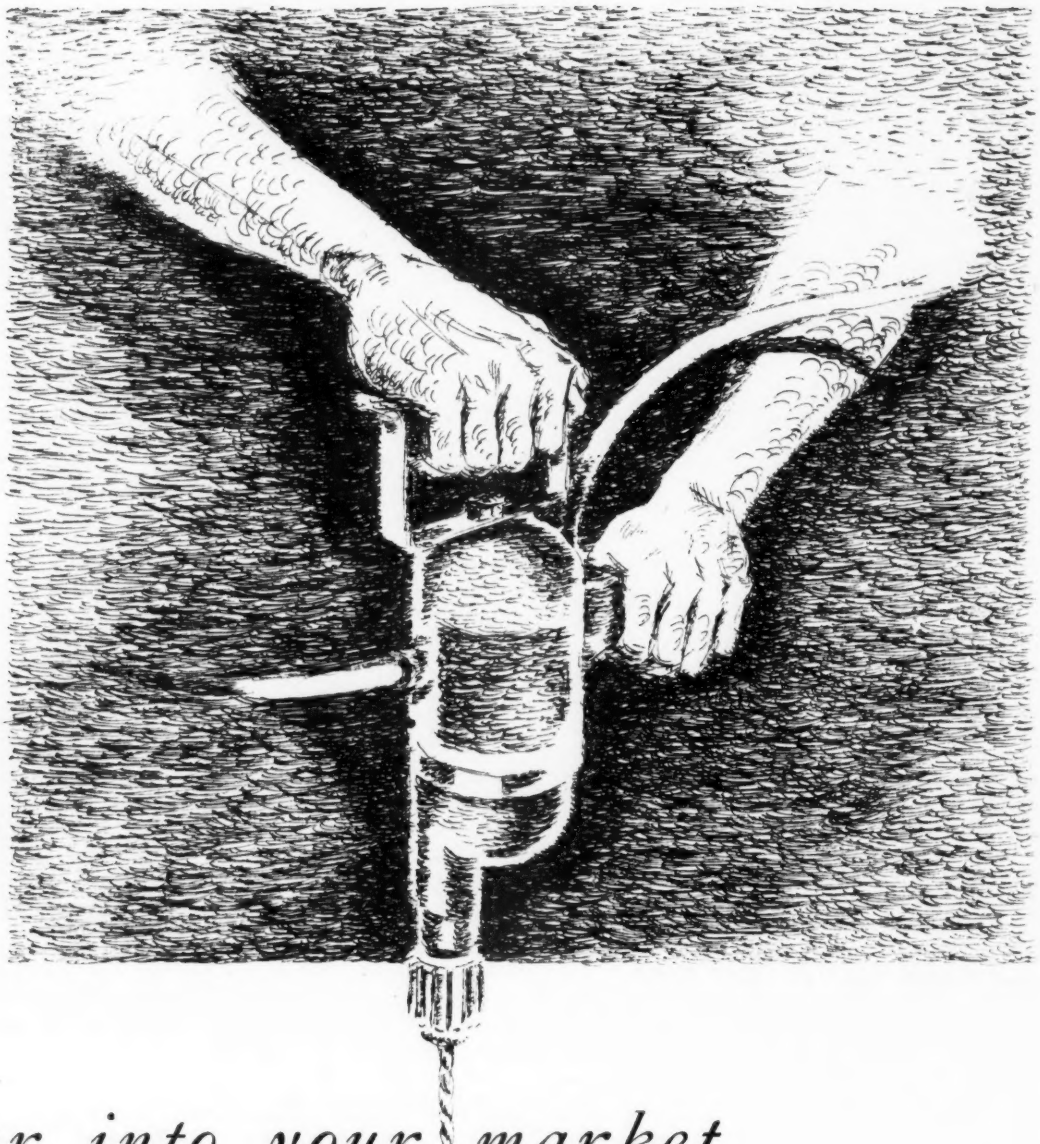
STAUFFER *Guaranteed by its name*



# *Deeper into your market*

OFTEN, the ability to cut through tough competition and penetrate today's markets can be attained in the laboratory, for practical chemistry puts a keener edge on the implements of progress. Sometimes this "whetting" process involves the steady supply of chemicals hitherto unobtainable in adequate quantity-with-quality; sometimes it involves the determination of formulæ which shave costs or speed production.

In any case V-C stands ready to serve you, with an extensive technical staff that takes delight in boring into tough industrial problems.

**V-C CHEMICALS**

**PHOSPHORIC ACIDS**
**CALCIUM PHOSPHATES**
**SODIUM PHOSPHATES**
**SPECIAL PHOSPHATES**
**AND COMPOUNDS**

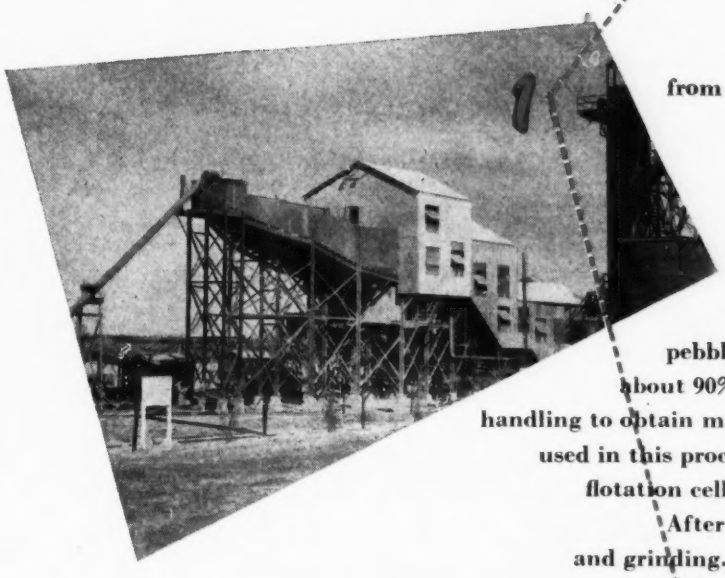
*Write for your copy of the new V-C Chemicals Product Book.*

VC CHEMICALS

VIRGINIA-CAROLINA CHEMICAL CORPORATION Richmond, Virginia

HAND IN HAND WITH INDUSTRY

# HOW INTERNATIONAL RECOVERS LIFE-GIVING PHOSPHATE ROCK AT ITS FLORIDA OPERATIONS

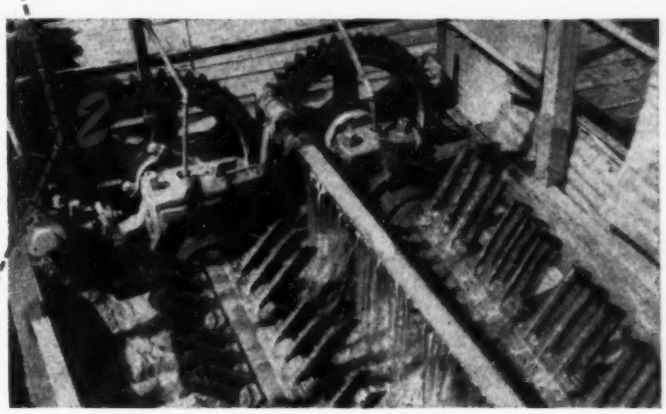


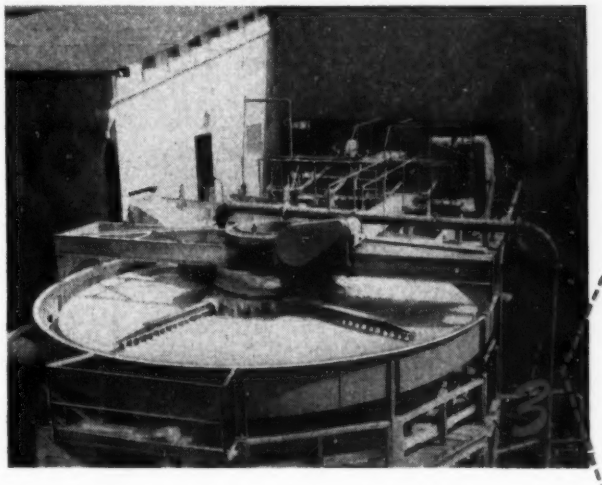
Phosphate rock matrix is pumped directly from the mine field through pipelines to the top of washer plant as shown in photo No. 1.

It then passes through the log washer (photo No. 2) where paddles and additional water reduce it to a slurry of pebbles, sand and water.

This slurry passes over screens which separate pebbles as to size. The smaller pebbles, representing about 90% of total phosphate intake, require extensive handling to obtain maximum recovery. Equipment used in this process includes classifiers, (photo No. 3) tables, flotation cells and huge, outdoor settling tanks.

After recovery, the phosphates are then ready for drying and grinding.





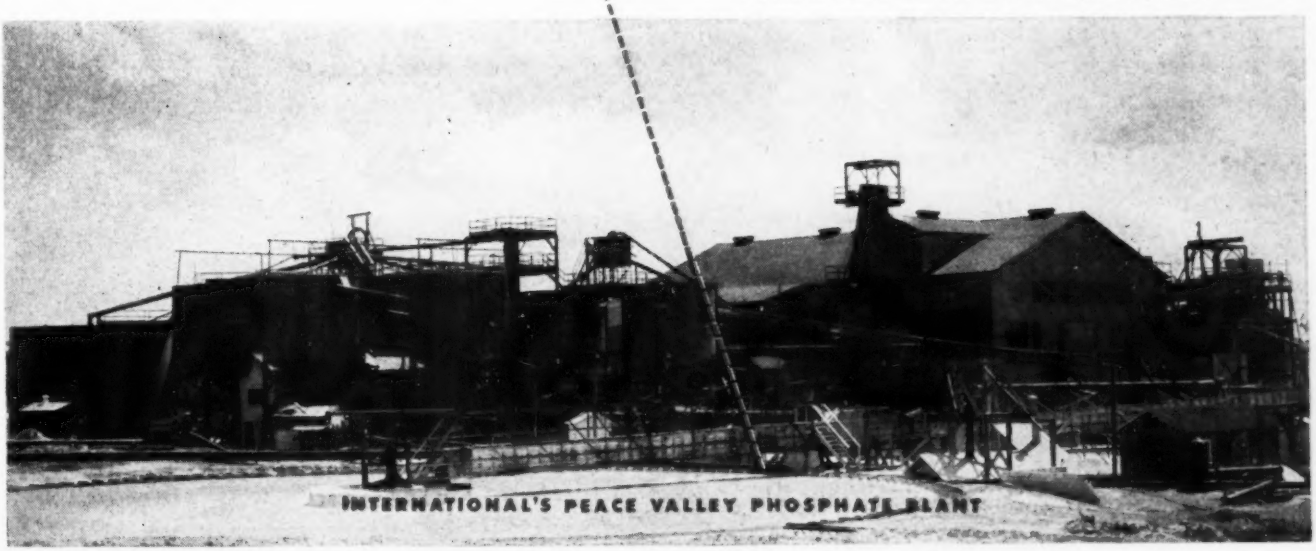
PHOSPHATE DIVISION

International

MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

This is the second in a series of 3 pictorial descriptions showing primary operations in the Mining, Recovery and Preparation of International Phosphate Rock for use in industry and agriculture.



INTERNATIONAL'S PEACE VALLEY PHOSPHATE PLANT

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

# How much longer can your company afford to "refuse business tactfully"?

LET'S FACE IT — the honeymoon is about over. It was fun while it lasted, but it won't pay the rent. Not now.

After an absence of seven years, the spectre of a buyers' market is once more rearing its head, and its expression plainly reads—"I'm going to be hard to get."

This doesn't scare anybody who hasn't forgotten *how to sell.* But there are quite a few of us in American business who could use a quick refresher course. (We've had a long "vacation.")

When it comes to production, our output is up almost 100 per cent. We've acquired a lot of new techniques on the assembly line, because it was obvious that if there were to be any profits left—after increased labor costs, high-priced materials, and taxes—we'd have to trim every last ounce of fat off the manufacturing cost per unit.

But now the time has come when we must apply the same philosophy to the *manufacture of a sale.* That means—*more mechanization!*

Confronted with a buyers' market, how much will it cost *your* company to produce one unit of sale? A prohibitive sum, if you're going to depend entirely on personal contact. You'd have to hire a tremendous force of salesmen to cover the field. Even then, much of their valuable time would be spent on "missionary work"—which is really a job for *mechanized selling.*

Mechanized selling is simply another name for consistent and aggressive advertising. Like the machine on the production line, it is a multiplier of men's efforts, for it enables them to produce (*and earn*) far more than they could alone.

And when it goes to work in the business press, it becomes the most efficient machine at your disposal for *manufacturing sales at a profit!*

*Just how efficiently does business paper advertising work? If you'd like to see some examples, we'll be glad to send you a recent ABP folder on actual results. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.*

**CHEMICAL INDUSTRIES**

*is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.*

# Have you considered new uses for Carbon Disulfide—(Bisulfide)?

Many chemists and chemical engineers are finding that $CS_2$ offers a possible starting point for a wide variety of organic reactions. Because Carbon Disulfide is a low-cost basic material—and is obtainable as an extremely pure chemical—the appeal for new uses is particularly strong.

Baker's method of manufacturing Carbon Disulfide is unique. An unusual electro-thermic method is coupled with continuous rather than batch distillation. This further insures uniformity of the finished product.

By using this Baker method and exercising extreme care in the choice of raw material, Baker's Carbon Disulfide is unusually free from other sulfides (assaying 99.99%).

If you are in development work and contemplate the use of Carbon Disulfide as a basic raw, we invite correspondence against present and future needs.

We have increased plant facilities, and are now in a position to serve more customers well.

**J. T. Baker Chemical Co., *Executive Offices and Plant:* Phillipsburg, N.J. *Branch Offices:* New York, Boston, Philadelphia and Chicago.**

Baker's

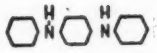
**Baker's Chemicals**

C. P. ANALYZED • FINE • INDUSTRIAL

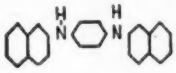
Baker's

# Good-rite CHEMICALS

## Di-secondary Aromatic Amines



**Diphenyl p-Phenylenediamine**

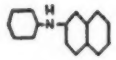


**Di B-Naphthyl p-Phenylenediamine**

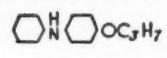
These chemicals are suggested for use as stabilizers, anti-oxidants, polymerization inhibitors, and for organic synthesis. It is believed that they will be of interest to technical men in the following industries: dye, explosives, drug, medicinals, petroleum, plastics, and photographic.

## *Other organic Chemicals*

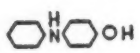
### Secondary Aromatic Amines



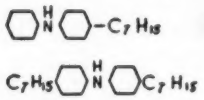
**Phenyl B-Naphthylamine**



**p-Isopropoxy Diphenylamine**



**p-Hydroxy Diphenylamine**



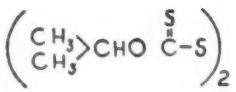
**Mixed Mono and Diheptyl Diphenylamines**

### Ethers of Hydroquinone

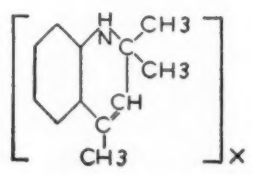
**Monobenzyl Ether of Hydroquinone**

**Dibenzyl Ether of Hydroquinone**

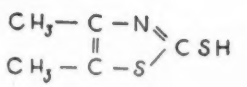
## *Miscellaneous*



**Di-Isopropyl Dixanthogen**



**Trimethyl Dihydro Quinoline Polymer**



**Mixed Ethyl and Dimethyl Mercaptothiazoles**

**N-Nitroso Diphenylamine**

All materials listed here are available in commercial quantities. Prices and technical information are available on request. Please write Dept. CE-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

# B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

## FROM SHELL CHEMICAL

# ALLYL ALCOHOL

$(CH_2=CH-CH_2OH)$

**AVAILABLE IN TANK CARS AND DRUMS**

**A highly versatile intermediate. Its olefinic double bond and hydroxyl group may be reacted separately or simultaneously to form a host of useful compounds**

**THE REACTIVITY** of Allyl Alcohol, either as an alcohol or an olefin, is considerably greater in most cases than that of saturated primary alcohols or simple olefins. Therefore a larger number of derivatives are more readily obtainable.

**DIRECT DERIVATIVES** of Allyl Alcohol include oxidation and reduction products, chlorohydrins, ethers, polymers, and esters of a variety of organic and inorganic acids.

**RESINOUS POLYMERS** are among its most important derivatives. Esters of dibasic acids or of acids containing conjugated double bonds readily polymerize in the presence of suitable catalysts. These polymers vary from viscous liquids to clear, hard thermosetting plastics.

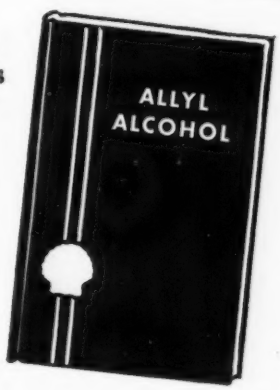
*A request on your business letterhead will bring a copy of Technical Book SC: 46-32.*

### PHYSICAL PROPERTIES

| | |
|---|---|
| Specific Gravity 20°/20°C | .8535 |
| Boiling Point (760 mm) | 96.9°C |
| Flash Point (open cup) | 90°F |
| (closed cup) | 72°F |
| Refractive Index, $N_D^{20}$ | 1.4133 |
| Aqueous Solutions | Completely miscible with $H_2O$. Constant boiling mixture at 88.9°C, containing 72.3% by weight allyl alcohol |

### SPECIFICATIONS

| | |
|---|---|
| Purity | Minimum 98% by wt. |
| Specific Gravity (20°/20°C) | .852 to .855 |
| Color (platinum-cobalt scale) | Maximum 15 |
| Water | Maximum .3% |
| Distillation Range | Below 95°C: None<br>Above 98°C: None |




Among the many other Shell Chemical products are Allyl Chloride, Epichlorohydrin, Glycerol Dichlorohydrin, Acetone and Diacetone Alcohol

®

# SHELL CHEMICAL CORPORATION

100 Bush Street, San Francisco 6 • 500 Fifth Avenue, New York 18

Los Angeles • Houston • St. Louis • Chicago • Cleveland • Boston • Detroit

**K** reelon is a new synthetic organic detergent that

**R** educes the surface tension of water and aqueous solutions

**E** ffectively. It peptizes, disperses, penetrates,

**E** mulsifies and cleanses as it wets. Its superiority

**L** ies in its ability to work well in acid, alkaline

**O** r neutral solutions—alone or in the presence of a

**N** umber of other chemicals—in hard or soft waters.

●

*Write for a free copy of our new 28-page booklet on the chemical properties and suggested uses of Wyandotte Kreelon.*

**Kreelon was developed in the Research Laboratories of the Wyandotte Chemicals Corporation to meet the demands of modern industry for a high-quality synthetic detergent. It has countless applications in the Paper, Textile, Laundry, Dairy and many other industries. Wyandotte Kreelon is economically priced for quantity or small lot consumption.**

Wyandotte
REG. U. S. PAT. OFF.

**WYANDOTTE CHEMICALS CORPORATION**

WYANDOTTE, MICHIGAN • OFFICES IN PRINCIPAL CITIES

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine • Hydrogen • Dry Ice • Glycols
Ethylene Dichloride • Propylene Dichloride • Chloroethers • Aromatic Sulfonic Acid Derivatives • Other Organic and Inorganic Chemicals

DOUBLE CHECKED ✓ FROM RESEARCH TO INDUSTRY

# SHARPLES DICHLOROPENTANES

★ Low priced chlorinated solvent.

★ Prompt delivery in large or small quantities.

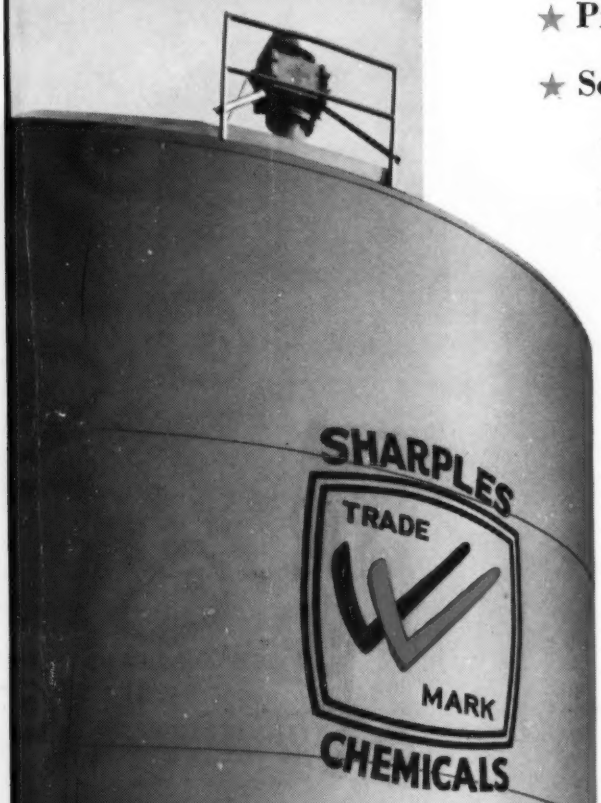
★ Solvent for:

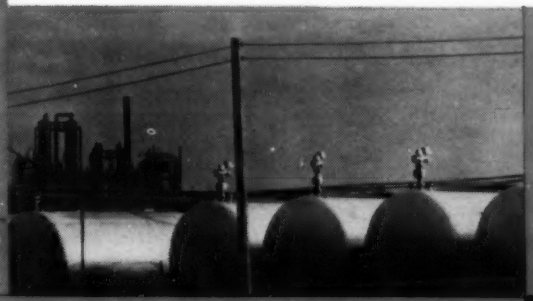
Oils, greases, bituminous materials, nitrile rubbers, vulcanized rubber, unvulcanized rubber and certain resins.

## SPECIFICATIONS — DICHLOROPENTANES 14

| | |
|---|---|
| Color | Water white to light yellow |
| Clarity | No turbidity or suspended matter |
| Specific Gravity @ 20/20°C. | 1.06-1.08 |
| Neutralization Value Mg KOH/g Maximum | 0.30 |
| Distillation: 95% between | 130-200°C. |

*Further information and samples gladly furnished*



**SHARPLES CHEMICALS INC.**

PHILADELPHIA CHICAGO NEW YORK

# SHARPLES SYNTHETIC ORGANIC CHEMICALS

PENTASOL* (AMYL ALCOHOLS) BURAMINE* (BUTYL UREA, Tech.)
ORTHOPHEN* (o-AMYLPHENOL)
PENT-ACETATE* (AMYL ACETATE) PENTAPHEN* (p-tert-AMYLPHENOL)
PENTALARM* (AMYL MERCAPTAN) VULTACS* (ALKYL PHENOL SULFIDES)
PENTALENES* (AMYL NAPHTHALENES)

AMYLAMINE ETHYLAMINE BUTYLAMINE
DIAMYLAMINE DIETHYLAMINE DIBUTYLAMINE
TRIAMYLAMINE TRIETHYLAMINE TRIBUTYLAMINE
DIETHYLAMINOETHANOL TETRAETHYLTHIURAM DISULFIDE
ETHYLETHANOLAMINES 161 TETRAETHYLTHIURAM MONOSULFIDE
DI-sec-AMYLPHENOL TETRAMETHYLTHIURAM DISULFIDE
ZINC DIETHYLDITHIOCARBAMATE
ZINC DIMETHYLDITHIOCARBAMATE
ZINC DIBUTYLDITHIOCARBAMATE
SELENIUM DIETHYLDITHIOCARBAMATE
AMYL CHLORIDES o-tert-AMYLPHENOL o-sec-AMYLPHENOL
DICHLORO PENTANES DI-tert-AMYLPHENOL AMYL SULFIDE
DIAMYLPHENOXYETHANOL

* Trademark Registered

## SHARPLES CHEMICALS INC.

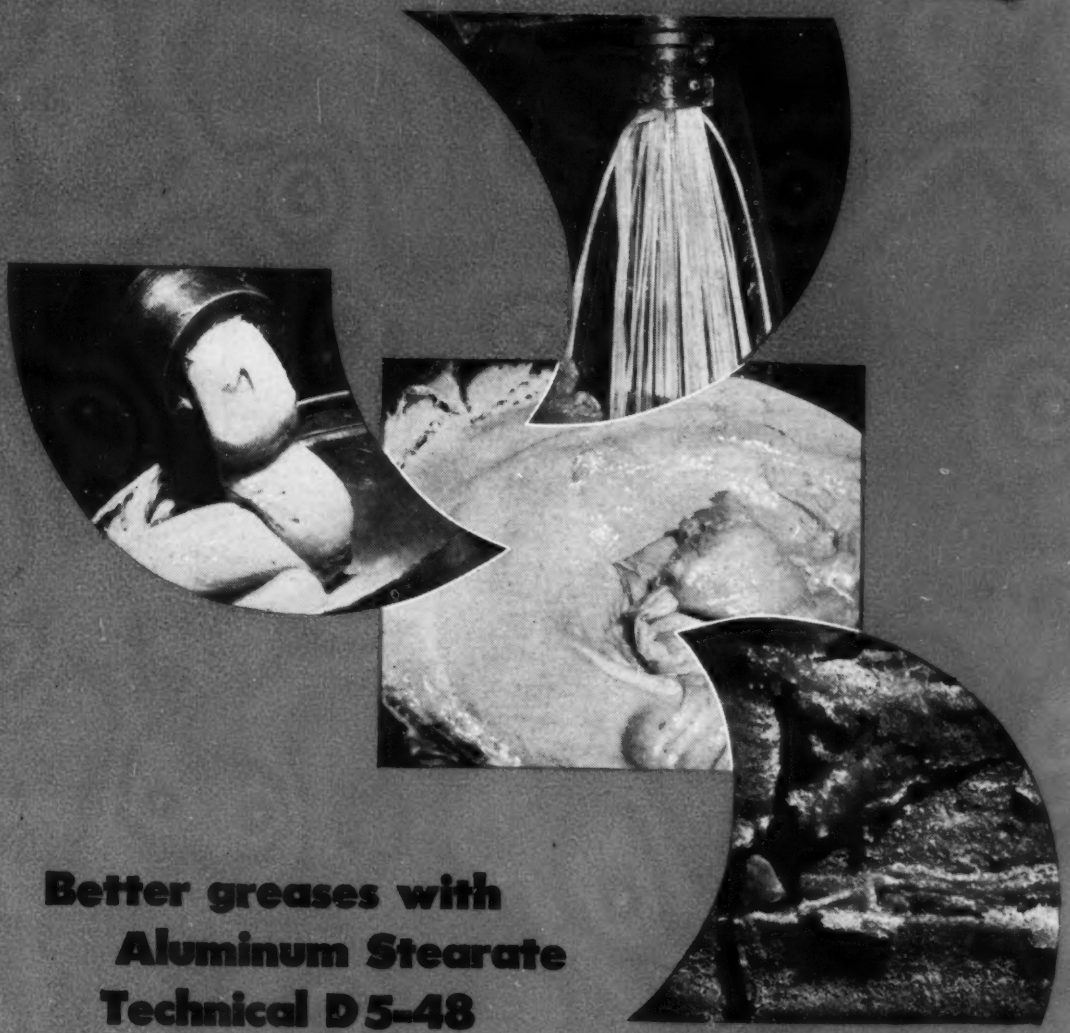
EXECUTIVE OFFICES: PHILADELPHIA, PA.
PLANT: WYANDOTTE, MICH.

*Sales Offices*

NEW YORK CHICAGO

West Coast: MARTIN, HOYT & MILNE, INC., Los Angeles . . San Francisco . . Seattle
Mining Representative: ANDREW CLAUSEN, 1826 Herbert Ave., Salt Lake City 5, Utah
Canada: SHAWINIGAN CHEMICALS LTD., Montreal, Quebec . . Toronto, Ontario
Export: AIRCO EXPORT CORP., New York City

MALLINCKRODT



# Better greases with Aluminum Stearate Technical D 5-48

Grease plant photographs courtesy of Standard Oil Co. (N. J.)

Grease makers report:

—that Aluminum Stearate Technical D 5-48 *raises the dropping point* of their grease about 5°F. above that obtained with most aluminum stearates;

—that D 5-48 *improves gel strength*; and

—that D 5-48 *goes farther.*

Mallinckrodt Research developed D 5-48 especially to meet these requirements of grease makers. Aluminum stearates is not the only factor controlling the quality of greases, but only the right grades of aluminum stearate make greases satisfactory for specific services.

**ALUMINUM STEARATE TECHNICAL D 5-48**
**Al (OH) $(C_{18}H_{35}O_2)_2$**

| | |
|---|---|
| Appearance | —White or slightly yellow-white powder |
| Softening Point | —155-160°C |
| $Al_2O_3$ | —8.7-9.8% |
| Water-Soluble Salts | —0.5-1.0% |
| Bulk | —45-50 fl. oz./lb. |
| Acetone Extractable | —6-7% |
| Water | —0.5-1% |

Mallinckrodt Chemical Works has worked closely with grease makers for over a quarter of a century and has built up a large fund of information and experience to help solve grease-making problems. This is at your service for the asking. Write for detailed information on uses and grades of aluminum, barium, calcium, strontium and other stearates used in greases.

MALLINCKRODT CHEMICAL WORKS

81 YEARS OF SERVICE TO CHEMICAL USERS

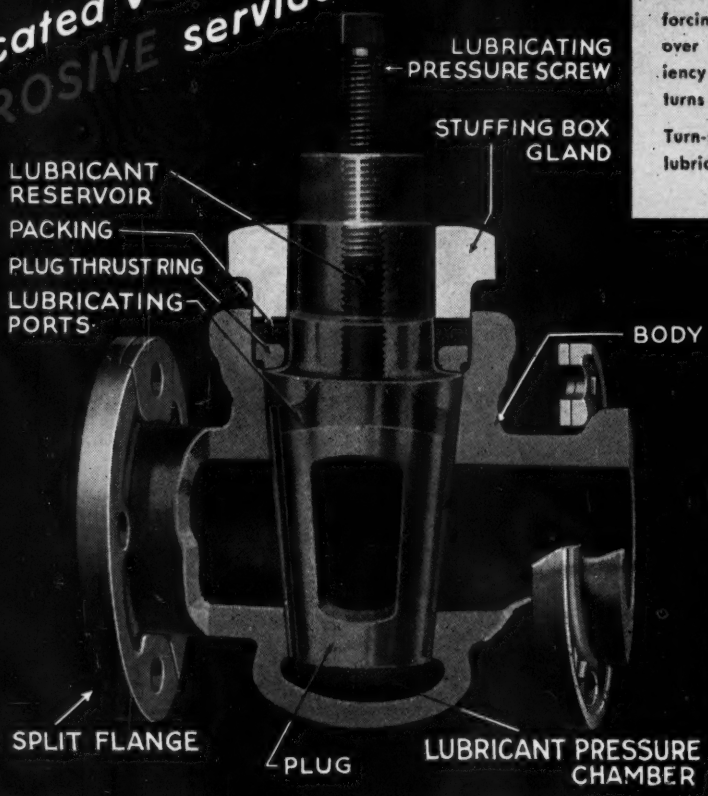
UNIFORM DEPENDABLE PURITY

MALLINCKRODT STREET, ST. LOUIS 7, MO. • 72 GOLD STREET, NEW YORK 8, N. Y.

CHICAGO • CINCINNATI • CLEVELAND • LOS ANGELES • MONTREAL • PHILADELPHIA • SAN FRANCISCO

# INSIDE STORY

## of a lubricated valve for CORROSIVE service




### HOW THE VALVE OPERATES

The screw in the stem forces lubricant through the channels of the plug into the reservoir and pressure chamber at the bottom of the body. A turn of the pressure screw lifts the plug hydraulically from the seat for easy turning, at the same time forcing lubricant from the grooves over the seating surface. The resiliency of the acid-resisting packing returns the plug to its normal position.

Turn-stops prevent exposure of the lubricant channels to the liquid.

This look inside a Durco top lubricated plug valve tells the story of permanent, through-and-through corrosion-resistance.

Every part of the valve in contact with corrosive solutions is of Duriron or Durichlor. These Durco high silicon irons have almost perfect resistance to the corrosive action of most commercial corrosives. Durichlor has much greater resistance to hydrochloric acid and chlorides.

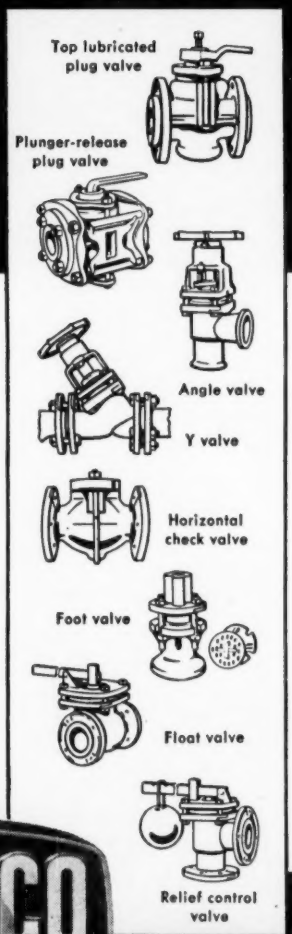
These valves are especially suited for muriatic acid and other corrosives having no lubricating properties.

Valves available: Standard straight-way type. Sizes 1", 1½", 2", 2½", 3", 4", and 6". Also available in 3-way, 2-port and 3-way 3-port.

For complete details ask for your copy of bulletin 617.

DURCO Adv. 27-GM

### CORROSION-RESISTANT DURCO VALVES




THE DURIRON CO., INC.
DAYTON 1, OHIO
BRANCH OFFICES IN PRINCIPAL CITIES

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

# Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES


For Your Information:

Newsletter
January, 1948

Manufacturers of polyethylene sheeting are aiming for tonnage business. That the new film will become a strong competitor of cellophane is one widely-held belief. Lighter in weight than the latter, polyethylene film can sell at a higher cost per pound, still be competitive on a cost-per-sheet basis. Another outlet destined to use a large tonnage: refrigerator ice-cube trays. At least one refrigerator manufacturer will standardize on polyethylene trays within a month.

The Aluminum Co. of America has made no official announcement as yet, but its development men are pushing investigations on high-purity aluminum. Although it is expensive and soft, it is highly resistant to dilute phosphoric, hydrochloric, and sulfuric acids. Most commercial aluminum runs 99.4 per cent pure (bulk of the remainder: iron and silica); the new products, tagged M-166 and M-167, run considerably purer.

* * * * *

Dorr Co. will soon bring in a lime-reburning unit in connection with the city of Lansing's (Mich.) water-softening plant. Treatment of the sludge by means of the Fluo-solid process yields pelleted lime, which can be recycled. Now being designed by Dorr for International Paper Co. is a large unit to reclaim lime from paper-mill sludge.

Still in the experimental stage at Davison Chemical Corp. is a new ultra-finely divided silica gel. If use of the material as a flatting agent in paints works out as well as the company anticipates, commercial production may be expected in the near future. The product is not an aerogel.

* * * * *

Now moving up into the rank of tonnage products is Metalloy Corp.'s lithium amide. More stable than the better-known sodium amide, it is finding its largest market among pharmaceutical manufacturers as an agent for organic condensations, especially in the synthesis of anti-histamine drugs.

Keep an eye open for a new cake-form synthetic detergent. Produced experimentally in Atlas Powder Co.'s laboratories, its commercial possibilities are now being evaluated. It is based on G-1226 (a fatty acid polyoxyethylene derivative) and an organic filler. Atlas's manufacturing and sales policy is not yet definite; it may license cake-forming process to customers.

Sharples-Continental Corp. is now making dodecyltoluene. The material may be sold as such or as a mixture with nonylnaphthalene for sulfonation to detergents. Its sulfonation products have higher foaming power than the naphthalene compound.

Within the next few months you may hear that Sun Chemical Co. has broadened its sales coverage by appointing a West Coast agent. The company is now negotiating with several Western distributors. Items to be sold in that manner are limited to stearates, microcrystalline waxes, and textile specialties.

* * * * *

Trial runs are now under way at Jefferson Chemical Co.'s Port Neches, Texas, plant. Full-scale operation--if expectations are fulfilled--will be reached next month. Among the products to be made are ethylene oxide, ethylene glycol, methylene dichloride, polyethylene glycols, and an aromatic fraction.

Large bags (capable of holding 100 lbs. of material) are a new, novel application of Vinylite. They are being used for shipping pre-plasticized polyvinyl butyral for windshield "sandwiches." Uses for shipment of vitamin concentrates, pharmaceuticals, etc., where contamination must be avoided, are being explored.

* * * * *

Ammonia manufacturers are daily becoming more excited about the potential market for anhydrous ammonia to be used for direct application to soils. Experiments at the University of Illinois bear out the contention that many soils, fertile in other respects, are nitrogen-deficient. Although no loss of fertility is apparent, the soil loses its organic, "top-soil" quality, reverts to clay, erodes more rapidly.

A wool blanket that will be mothproof, germicidal, and dust-retentive (to prevent dust-borne diseases, aggravation of allergies), and still not forgo any of wool's desirable properties, is the aim of a research project under way at Lehigh University for the Army Quartermaster Corps. Of all the treatments for dust retention investigated so far, the best seems to be a very light coating of white mineral oil.

* * * * *

Here and There:

Aluminum Co. of Canada's chlorine-caustic unit at Arvida, Que., first extramural installation of the Mathieson cell, is scheduled to come in this month ... Several new types of Celite catalysts are in the development stage at Johns-Manville Corp. ... An aliphatic nitro compound looks promising as a synthetic tanning agent, is now being evaluated ... Operation of Pittsburgh Plate Glass Co.'s chlorine plant at Lake Charles, La., which started up October 15, has reached capacity this month ... An automatic fraction collector for chromatographic analyses, developed by Drs. Stine and Moore of Rockefeller Institute, is being manufactured by the Technicon Co. Anticipated customers are hospitals, biochemical labs, etc. ... A novel no-creep tumbling mill has been developed by U. S. Stoneware Co. The mill rotates on one convex, one concave roll (rather than two cylindrical ones); creep is eliminated.

The Editors

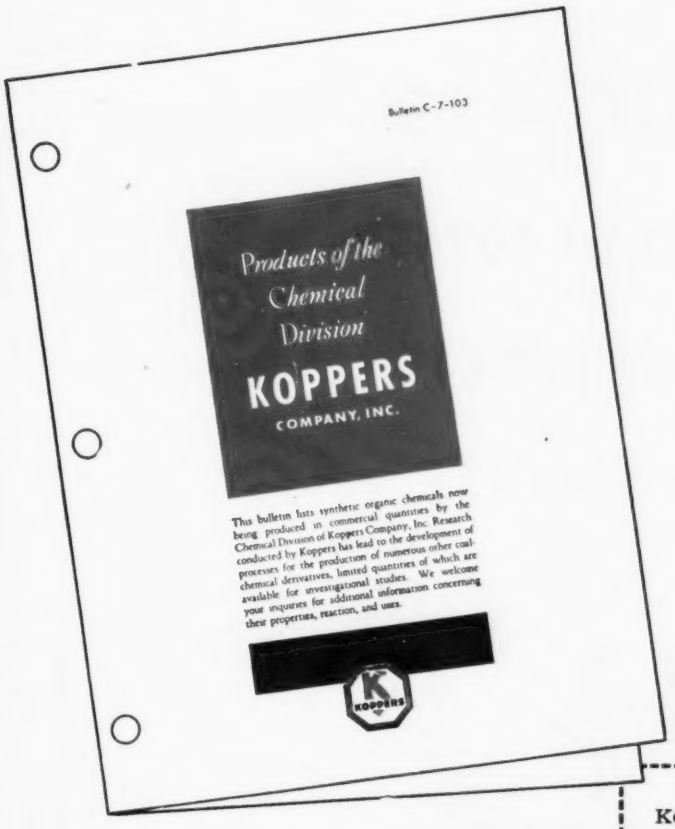
Koppers has just issued a new folder

# on SYNTHETIC ORGANIC CHEMICALS

which gives **properties**
**reactions**
**uses**
**structural formulae**

*For These products*

sec-BUTYLBENZENE
CATECHOL
meta-CRESOL
DIAMYL PHENOLS
DIETHYLBENZENE
DIHYDROXYDIPHENYL SULFONE
DI-tert-BUTYL-meta-CRESOL
DI-tert-BUTYL-para-CRESOL
DIVINYL BENZENE
ETHYLBENZENE
HYDROCYANIC ACID
HYDROGEN CYANIDE, Industrial Grade
beta-METHYL UMBELLIFERONE
MONOCHLOROBENZENE
MONO-tert-BUTYL-meta-CRESOL
PENACOLITE ®ADHESIVES
PHENOLSULFONIC ACID
PHTHALIC ANHYDRIDE
POLYETHYLBENZENE
POLYSTYRENE
PROPIOPHENONE
beta-RESORCYLIC ACID
RESORCINOL
STYRENE MONOMER
SODIUM SULFITE
SULFURIC ACID
TRIETHYLBENZENE
VINYLCYCLOHEXENE


Bulletin C-7-103
Products of the Chemical Division
KOPPERS
COMPANY, INC.
This bulletin lists synthetic organic chemicals now being produced in commercial quantities by the Chemical Division of Koppers Company, Inc. Research conducted by Koppers has lead to the development of processes for the production of numerous other coal-chemical derivatives, limited quantities of which are available for investigational studies. We welcome your inquiries for additional information concerning their properties, reaction, and uses.
KOPPERS

*Write for a copy of this helpful folder for your reference.*

**KOPPERS COMPANY, INC.**
**Chemical Division**
PITTSBURGH 19, PA.

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CHEMICAL DIVISION
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Please send me a copy of the new folder on Synthetic Organic Chemicals.

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# PROFITEERING IN CHEMICALS

*by* ***ROBERT L. TAYLOR, Editor***

THIS ISN'T A SUBJECT WE LIKE TO TALK ABOUT, but it is no secret that a few unscrupulous and grasping individuals are carrying on a thriving "gray" market in certain scarce chemicals today at the expense not only of users of these chemicals but of the reputation of the chemical industry itself. That one or two such people to our knowledge have even had the nerve to sit back with their thumbs in their vests and admire their own sagacity is nothing short of nauseating.

***Profiteering in chemicals*** can be discouraged in two ways.

One is to return to government-controlled prices, which nobody wants.

The other is for manufacturers and reputable resellers of scarce chemicals to follow the lead already set by some producers of bluntly refusing to sell to any customer who is known to have engaged in reselling material at exorbitant prices.

Calco Chemical Division of American Cyanamid Co., a major producer of dyestuffs, publicly proclaimed a policy along the latter lines in no uncertain terms last month. "For consumers to order dyes for the purpose of resale to black markets is not only a breach of contract but a breach of good faith," wrote J. Pfister, manager of Calco's dyestuffs department, to his customers. "If we can establish any such practice against anyone buying dyes from us, we shall take immediate action and promptly discontinue selling to such parties."

Some other manufacturers, like the National Lead Co. in the case of titanium dioxide, one of the chemicals in shortest supply, have inserted clauses in sales contracts stipulating that the goods sold must be consumed by the customer and not resold. National Lead has gone so far as to insist that its titanium dioxide be used only in products which the customer will market under his own brand name.

Other producers are carefully scrutinizing orders in relation to known actual requirements of customers. If orders appear to be excessive, the situation is investigated. In some cases, carriers have been helpful in tracing diverted shipments.

***These precautions are troublesome*** and require the expenditure of time and money. But they are a small price to pay compared with the ill will and longer-range consequences that would result from unbridled speculation and profiteering. They are also small compared with the price of a return to OPA.

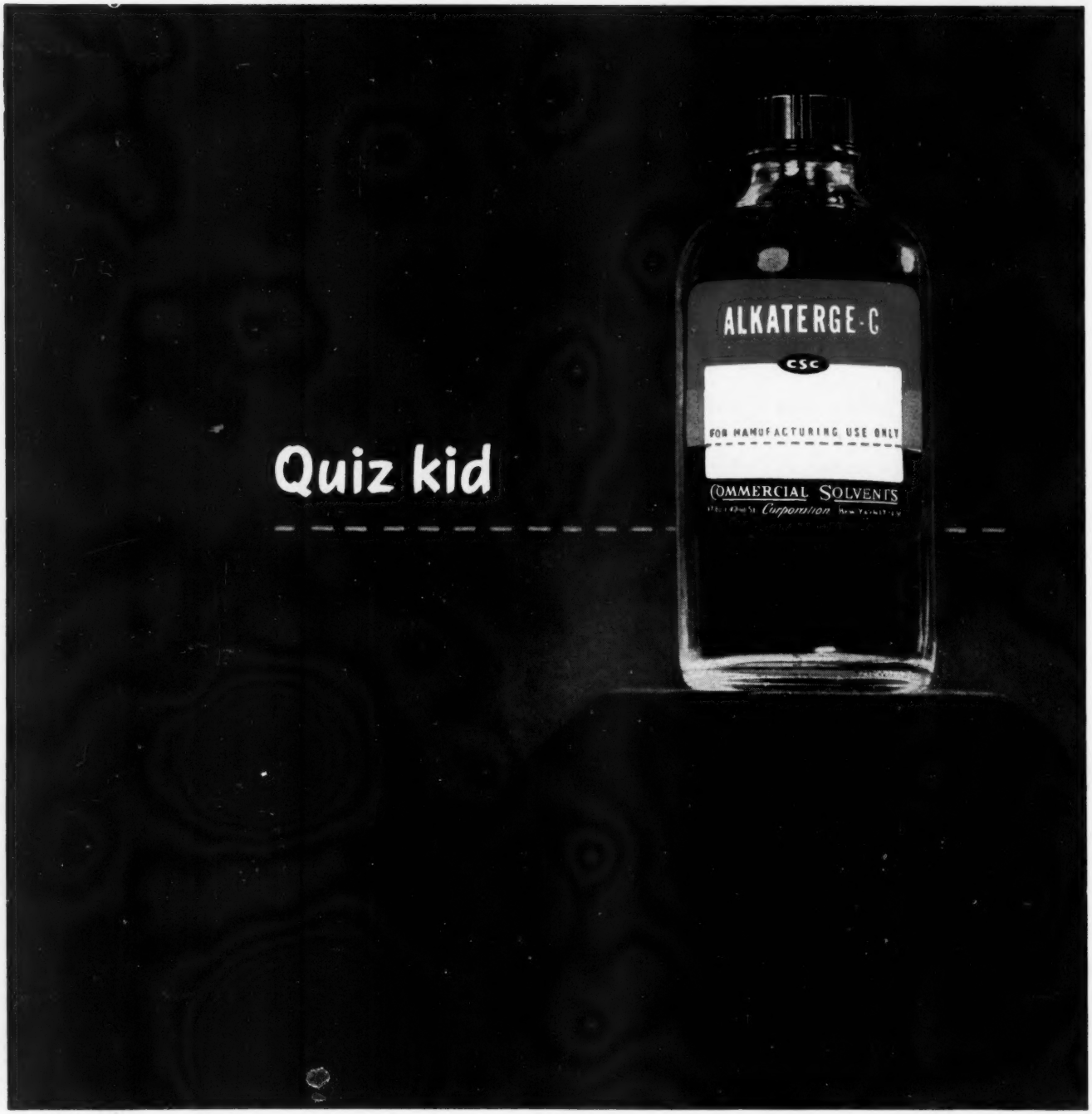
Even aside from the evils of profiteering, diversion of excessive amounts of scarce chemicals into resale channels, a large proportion of which ultimately lead to shipments out of the country, is extremely undesirable from a distribution standpoint at the present time. American manufacturers have a responsibility to assist in rehabilitating foreign countries, but such assistance must be kept within bounds and must not be by way of the gray markets. Domestic consumers whose needs are urgent and legitimate must not be deprived because a disproportionate amount of the total available supply is going to export.

***The profiteers in chemicals*** can be discouraged from plying their nefarious trade by firm and concerted action on the part of responsible manufacturers and sellers in the industry. No quarter need be given. Those few resellers who have unwarrantedly boosted prices, who have taken bonuses that might as well be called bribes, and who have willfully neglected their responsibilities to suppliers who served them in good faith, have lost their right to be called respectable business men.

## The High Cost of Working

ONE OF THE LARGE CHEMICAL COMPANIES RECENTLY estimated that it now costs it over $15,000 capital and about $500 a year just to put a man to work.

Maybe you'd better hire that new sample boy before the directors decide they have to hold a meeting to see whether they can afford him.




This sample bottle of CSC Alkaterge-C is on its way to answer a question. Somewhere, a manufacturer wants to know if this oil soluble surface-active agent can do a job for him. He will put this chemical specialty through a practical test in his own laboratory. If it solves his problem as promptly as many CSC samples do, it will soon be followed by gallons and drums.

CSC

A request for such a sample is frequently the first step in making familiar products better, and new products possible.

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# What's new

## WHAT PRICE EXPANSION IN '48?

**Money, and what it will buy, will continue to take top consideration in process industries expansion plans in 1948. Equipment, materials and manpower problems will be fewer.**

AVAILABILITY of the four M's—men, materials, machinery, and money, with emphasis on the money—will most likely be the principal determinant of the nature and extent of expansion that will take place in the chemical process industries in 1948.

Total demand for chemical products is showing no slacking off, and indeed seems headed to maintain or even exceed its breakneck pace of 1947. In addition to large increases in consumption of old established products, a number of newer things, such as surface active agents, new chemicals for agriculture, and recently developed polymers, are carving out new markets of their own which swell the total for the industry.

A poll of the chemical companies themselves, as well as some of the engineering and construction firms specializing in chemical work, indicates that there is still a large backlog of industrial construction in this field. Obsolescence and deferred requirements, together with further new products, will, according to the combined opinion, mean a continuation of new construction at a high level throughout the year. Organic chemicals, detergents, protective coatings, and synthetic fibers are among the specific process industries that are expected to contribute most heavily to the total outlay for the polled group.

### Construction Costs

The cost of constructing buildings and installing equipment, as distinct from the cost of the equipment itself, has been the most rapidly mounting element of plant expansion costs in the 2½ years since the end of the war. It is the feeling of those in the construction field that cost stabilization is more likely today than it was a year ago, but they are making no promises.

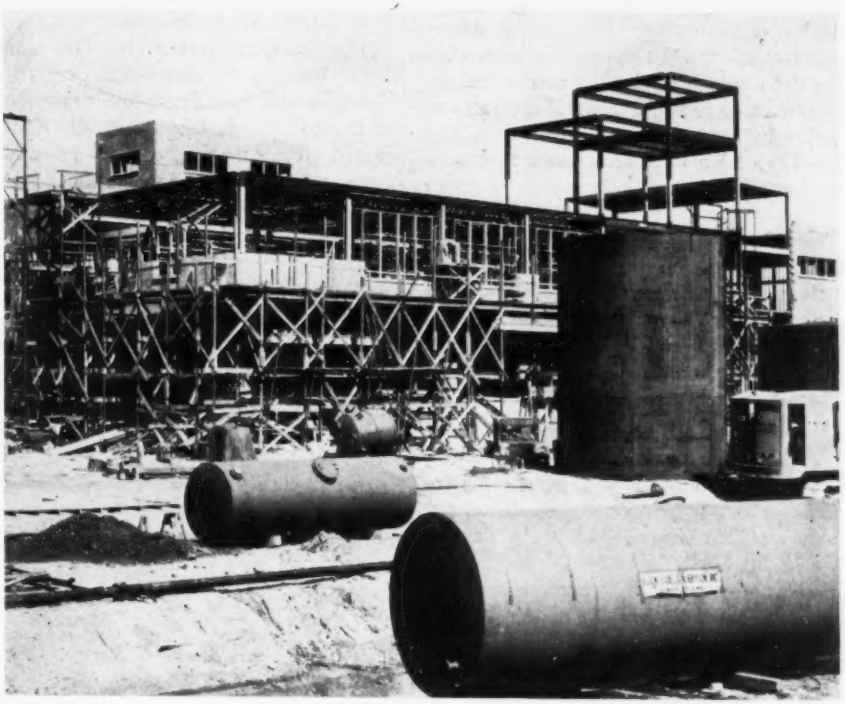
A concerted effort is being made in the construction industry, according to Otto F. Sieder, executive vice president of the H. K. Ferguson Co., to stabilize wages and increase productivity of labor so as to assist in stabilizing costs. But despite this, there is pretty general agreement that construction labor will present demands for increased wages in the early months of 1948 that will be reflected in still higher costs.

These and other uncertainties in the outlook have caused a few important chemical producers to carry over a policy started last year of deferring certain expansion projects that are not considered essential for the immediate future. As one of them put it, "We hesitate to lay out any more money until we can begin to see some return from that we have already spent."

Others, however, are going ahead without hesitation to provide production facilities for what they foresee as a continued high level of demand for their products. Perhaps most conspicuous among these is Monsanto Chemical Co., which has spent $50,000,000 over the past two years and has work under way which calls for an additional outlay of $58,000,000. Also among the larger companies, American Cyanamid, although pursuing a more modest program, is not holding back on projects it considers worthy of development. Two very recent announcements are Westvaco Chlorine Products Corp.'s plans for a large elemental phosphorus furnace to be constructed this year at Pocatello, Idaho, and Tennessee Products & Chemical Corp.'s $1,000,000 addition to its Chattanooga, Tenn., works to make organic intermediates.

### Equipment

Principal blot in the equipment picture is still the shortage of steel, although



*Wyandotte Chemicals Corp.*

CHEMICAL CONSTRUCTION BOOM: How far will it go in '48?

in some lines shop and foundry facilities are a bottleneck. Backlogs of orders for almost all types of equipment are smaller than they were at the beginning of last year. For most standard stock units, the situation on heat exchangers is typical: about two months for delivery now, as against 6 to 10 months a year ago. Custom built items, on the other hand, are taking from four months up to a year or more for delivery.

How much the steel situation will ease —if any—in 1948, is difficult to say. Mills are continuing to allocate tonnages, with preference in some cases to consumer industries. Meanwhile the shortages have knocked prices of some items important to equipment makers completely out of line. Cast iron is an example. One fabricator stated that he recently built an evaporator of stainless-clad steel that ordinarily would have been made of cast iron, simply because "you couldn't see the difference in price."

But while it seems agreed that most chemical equipment items should become easier to get during 1948, there is almost as general agreement that prices will go up at the same time. Some purchasers, in fact, anticipate a return to "negotiated prices" based on the escalator principle, although they hasten to add that escalator advances will be resisted as far as possible. Among the equipment items expected to head upward in price are electric motors, automatic controls, foundry products and machine parts.

### Manpower

Not least among the troubles mentioned by the equipment makers and engineering firms is the continued manpower shortage. While the availability of labor has improved generally throughout the country, certain crafts are still critically short. This is particularly true of bricklayers and pipefitters. In some areas where untrained men are available, accelerated apprentice courses are being inaugurated to remedy the situation.

The design firms also report that engineers experienced in process industries work are still difficult to find. While recent graduates, and those with limited experience, are becoming available in greater numbers, qualified process engineers are in increased demand both in the chemical process industries and in the engineering companies, and practically no supply is available.

### Money

In the final analysis, availability of money to pay the bills may be the determining factor in a good many expansion plans for 1948.

Money for capital expansion is not as readily available as it was a couple of years ago when the securities markets were still in their vigorous upswing. Depressed stock prices, along with a hesitancy on the part of buyers to snap up new issues without the inducement of bargain rates, do not make equity financing very attractive at the moment. At the same time, many companies do not want to assume the heavy fixed obligations of bond issues.

The result of this situation has been that the biggest single source of new money for industry in 1947 was its own profits. This will probably again be the case in 1948, and unless there is a major stock market revival during the year, earnings are likely to set an automatic limit on the amount of expansion money that will be available to many companies.

## NITRATE SEQUEL

**The Inter-Agency Committee has officially reported its recommendations on ammonium nitrate handling.**

SINCE the Coast Guard and the Army instituted certain precautions in the handling of ammonium nitrate (CI, September, 1947, page 377), an Inter-Agency Committee has been quietly working. Last month it reported its recommendations to its boss, Secretary of the Treasury John W. Snyder. The Treasury Department has jurisdiction over the U. S. Coast Guard which, in turn, is responsible for ocean shipments of the dangerous material; it was therefore to Secretary Snyder's interest to assemble the experts' facts and opinions for the guidance of his sea-going policemen.

The Committee he appointed represents interested government departments and private agencies: the Army, Navy and Coast Guard; the Departments of Interior, Agriculture, and Commerce; the Interstate Commerce Commission; the U. S. Maritime Commission; and the Association of American Railroads.

The group recognized the "no man's land" between the Interstate Commerce Commission's jurisdiction over rail shipments to the dockside and the Coast Guard's control over cargoes in ships' bottoms. The interim operations—loading, unloading, and warehousing at the wharf—are beyond the law, except for local regulations. "The committee believes," says the report, "that the port authorities and the municipalities in which a port is located should accept more responsibility for safeguarding their port facilities and adjacent property. The port of Texas City was a private port when measured by the yardstick of some of our other great ports, and is an outstanding example of a congested port engaged in hazardous operations without adequate safety controls."

**NITRATE FOR SHIPMENT: "ways and means to transport . . . with reasonable safety."**

### Some Changes Made

The Committee also recognized that its recommendations were merely recommendations, i.e., it had no authority: but it urged that they be incorporated into legislation wherever possible.

Among the recommendations: Allow shipment in specification paper containers (the Coast Guard wanted to prohibit combustible containers); label the containers; request funds from Congress to provide supervisory personnel; forbid a nitrate ship to carry sulfur at the same time; package the nitrate at less than 140°F (to prevent dehydration and embrittling of the paper); and observe certain precautions during loading, shipping, and unloading.

It was strongly urged—especially by the Bureau of Explosives—that ammonium nitrate not be stored in tight concrete warehouses, for such storage is tantamount to packing a shell with explosive. It is essential that storage buildings be well ventilated to prevent accumulation of heat and pressure in case of fire. Contrary to usual practice (where a fire is smothered by preventing access of air) fires in nitrate warehouses should be well ventilated.

### Worth the Cost

These and other recommendations, if enacted into law, will undoubtedly add to the cost of ammonium nitrate—either directly to the consumer or indirectly to the taxpayer, but "without considering any monetary value for the more than 400 lives lost at Texas City, the property loss is estimated at $75,000,000. This would represent at least 75 years of supervision cost, assuming that such a program prevented a repetition of such a casualty."

The Committee does not regard ammonium nitrate as a high explosive, for it cannot be detonated by shock or friction at temperatures below 200° F. The principal hazard to guard against is fire—especially under conditions where heat is accumulated and pressure is generated; and the recommendations are designed to prevent such conditions.

As a matter of policy, "the committee agrees that the program of relief of devastated countries and the economy of the American farmer will be adversely affected if ammonium nitrate fertilizer is not utilized.

"There are over a thousand different substances of a dangerous nature moving in commerce every day. . . . These substances are eventually used in various ways, including preservation of life, safeguarding the health of the community, compounding medicines, surgery in hospitals, replenishing the soil . . . and for other creature comforts. The security of our country is to a major degree dependent upon explosives and other dangerous articles possessing major hazards. The economy of the country is influenced to a considerable degree by the safe transportation of dangerous articles.

"To prohibit the transportation of any dangerous article or to impose restrictions of such severity as to make their transportation economically impracticable, would eliminate all hazard in connection therewith. However, this is not a practicable solution to the problem. . . . It is necessary to provide ways and means to transport these dangerous substances with reasonable safety."

# SPECIALTY BLITZ

**Sherwin-Williams puts a lot of steam behind its nonpaint lines, ends up with a robust specialty business.**

WHEN IT comes to insecticides, Sherwin-Williams Co. can hardly be regarded as a Johnny-come-lately. For, almost fifty years ago, the then-small organization decided that pest-free crops would mean more money for the farmer, felt that prosperous farmers would be able to buy more paint. That was the philosophy which lured Sherwin-Williams' founders into the business of making and selling agricultural chemicals—a frank desire to sell more paint, to "cover the earth."

Soon, however, S-W found that it had a "natural" set-up for manufacturing insecticides. It was a simple, direct step from making Paris Green (orginally used as a pigment) to lead arsenate. It was just as easy, and logical, for a concern producing dyestuffs to plunge into the manufacture of DDT. In addition, the paint company possessed another asset of substantial worth: Its long-established paint outlets could be counted on as low-cost distributors of any other items the company chose to promote.

### Ear-Deep in Insecticides

So, almost before the company realized it, S-W was ear-deep in the insecticide business. For years, nevertheless, main emphasis continued to be placed on those sold to farmers—bulk quantities of agricultural spray bases, etc. Recently, however, and particularly since Arthur W. Steudel assumed the presidency of the corporation, a new series of nonpaint items has been getting the "full treatment". As a result, Sherwin-Williams, already a major factor in paint and bulk agriculturals, is now aggressively contending for top honors in the marketing of small-package insecticides and kindred products for household use.

STEUDEL AND FORTIER: Razzle-dazzle pays off.

The big gun campaign actually began last year, when President Arthur Steudel and Vice-president M. J. Fortier let loose a nationwide razzle-dazzle selling campaign calculated to line up 98,000 additional outlets for the company's three most promising specialties. The three: Bug-Blaster, a DDT-rotenone powder, packaged in a 36 inch tube, 3 inches in diameter, which is designed for pumping the dust mixture onto flowers, shrubs or vegetables; Pestroy, a DDT insect powder in a puffer can; Weed-No-More, a 2,4-D weedkiller.

### A Super Barrage

Drilled like an army, 700 special salesmen were organized into "Blitzer gangs" of from three to twelve men. They began their crusade in Florida and California, worked their way north and east. Or, in other words, they followed the sun—pushing their warm weather merchandise and striving for cash bonuses, new autos, and a multitude of other prizes. They hit each district equipped with a list of potential new outlets, loaded with armfuls of samples, displays, and give-away literature. And, in case they didn't take every objective, a special mop-up crew followed on their heels. If, perchance, any retailer wasn't in the fold after the execution of this double attack, the permanent sales force in the area being blitzed were sent into the game for the touchdown play.

### Success With Shortcomings

In one respect this all-out foray was successful; in another it fell short of expectations. As originally planned, the company counted on using its 500 company-owned stores as warehouses and supply depots for its several specialties. However, partly because local managers could not handle the added business too well, and partly because many newly-won retailers were accustomed to dealing through grocery, hardware, or drug wholesalers, the strategy had to be changed. Now, rather than utilizing its well-located depots, S-W is distributing through the conventional wholesaler and jobber channels. Nonetheless, an important objective was realized. Close to the desired 98,000 merchants fell into line and a good part of the job which the wholesalers' salesman normally has to do was done for him. Retailers and the public came to know the trade-names which Sherwin-Williams pushed so zealously.

### New Items, New Fields

Nor is there any reason to believe that Steudel and his associates are going to ease up on nonpaint promotion. Last month, for instance, they set up an Agricultural Chemical Division so that sales, research and production could be more closely integrated. Too, although company officials do not talk expansively about future plans, they are busy studying the results of several market surveys which have been conducted during the past few months. The odds are that S-W will launch several new small-packaged items this year (a good bet: low pressure aerosols) and that they will push their selective weedkiller lines diligently. In addition, special attention is being paid to the possibility of selling large quantities of their plant hormone, Stop-Drop, in the Florida, Texas, and California citrus groves.

The company, as a paintmaker, has done right well, boasts a business volume crowding $250 million per annum. Now its nonpaint lines are well up in the multi-million dollar bracket, and they are not going to suffer from a lack of promotional steam.

# NUMBED NERVES

**A new tertiary amine, dibenamine, promises relief to sufferers from certain nerve diseases.**

BACK in 1945 William Gump, chief chemist of Givaudan-Delawanna, Inc., was working on a project involving quaternary ammonium compounds. In the course of his investigations he synthesized a large number of tertiary amines that didn't seem to have much use except as intermediates.

He mentioned his project to friend Louis Goodman, then at the University of Vermont and now a professor of pharmacology at the University of Utah, Salt Lake City. As any eager pharmacologist would, he suggested—and it was done—that Gump's series of compounds be tested for physiological activity. Out of that screening came a new therapeutic agent for diseases of the sympathetic nervous system.

### Unsympathetic Nerves

The best compound of the lot was dibenzyl-$\beta$-chloroethylamine hydrochloride, which is understandably called dibenamine for short. This compound, introduced intravenously in a dosage of 5 mg. per kg. of body weight, blocks nerves—i.e., prevents the muscle cell from responding to nerve impulses—just as effectively as if the nerves were removed by surgery.

The sympathetic (involuntary) nervous system often behaves very unsympathetically to its host. Many pathological conditions arise from disorders of that system, chief among which are Buerger's disease and Raynaud's disease. The latter is characterized by pale, cold, painful fingers and toes, often becoming gangrenous. Chronic hiccoughs, often lasting for weeks, are another dramatic manifestation of disordered nerves. Even high blood pressure can sometimes be aggravated by a maladjustment of the nervous system, and dibenamine's effect on this condition is now being studied. In frostbite, too, an injection of dibenamine into the healthy blood vessels surrounding the affected area may be successful.

Surgical removal of sympathetic nerves may be unnecessary, Dr. Goodman reports, if the apparent effectiveness of the new drug is borne out by more extensive clinical trials.

### But Not Today

Both Drs. Goodman and Gump make it clear that dibenamine is still in the investigational stage. Quantities have been released only to research scientists studying its medical possibilities. No application has yet been made to the Food and Drug Administration, and research is still going on in the attempt to find less toxic homologues. Some people are afflicted by nausea upon use of the drug.

**WILLIAM GUMP: His amine delivers a knockout punch.**

Research has apparently proved one thing: the necessity of the $\beta$-chloroethyl group. But that still leaves two other organic radicals to play with, and the possibility of variation is almost infinite. Perhaps similar drugs will be found that are better than the best so far; even if not, it looks as if doctors will have another blessing in their black bags.

# PYROFEROUS PACKAGE

**A new package unit for heating and circulating molten salt will permit wider use of this heat transfer medium.**

THERE is nothing new about the use of molten salt as a heat transfer medium. A good deal of information is available on it, and the material is particularly suited for transferring heat at temperatures in the range between steam and direct firing. Yet its use in industry has been confined to a few large plants and special applications. The reason appears to be the high cost of the installations required to handle th material, all of which in the past have had to be custom built for the job.

It is in recognition of this situation that Bethlehem Foundry and Machine Co., in collaboration with engineers of E. I. duPont de Nemours & Co., has developed and built what will be the first of a line of standard package units for molten salt heat transfer work. The original unit was presented last month by Bethlehem's president, J. Howard Van Sciver, to Lehigh University, which assisted in carrying out the experimental runs.

### Complete With Directions

Known as the "Beth-Tec Unit," the new package plant consists of a complete salt furnace with oil burner, salt sump, pump, automatic controls, and pushbutton control panel, all integrated into a single compact piece of equipment ready to be hooked up to the kettle, autoclave, or other piece of apparatus to be heated.

Bethlehem plans to make and sell the units in a pilot plant size and three standard commercial plant sizes, the latter ranging in capacity from heat transfer rates of 500,000 btu's per hour to 2,500,000 btu's per hour. Although prices have not yet been definitely set, company officials expect the 2,000,000 btu per hour unit to be tagged at between $18,000 and $20,000.

### The Medium

The first commercial use of molten salt as a heat transfer medium was in 1939 for controlling the temperature in the then-new catalytic cracking process. The salt used was a material known as Hi-Tec, a eutectic mixture of sodium nitrate, potassium nitrate, and sodium nitrite developed by Dupont especially for heat transfer service in the temperature range of 400-850°F. Hi-Tec is also the medium used in the new Bethlehem units.

Before molten salt, equipment designers were forced to rely on three other heat transfer media for the 400-850° range: (1) steam at high pressures, (2) organic materials, which require some pressure and which cannot be used much above 700°F. because of their tendency to decompose and build up excessive pressures, and (3) metallic mercury, which is expensive, toxic, and so heavy that it usually requires special supporting members to carry the boiler.

In contrast to these materials, molten salt does not require any more pressure than what is necessary to circulate it through the furnace and heat exchanger. It is light weight and in itself relatively inexpensive. Its heat stability is good, and only after a long time there is a slight decomposition of the nitrates, which raises the melting point. In one installation that has been in use since 1939, the melting point of the salt has risen only about 25 degrees.

The Hi-Tec material used in the Bethlehem units has a melting point of 280°F. The specific gravity of the molten mixture varies from 1.97 to 1.68 over the temperature range 300-1030°F. Specific heat is 0.32 for the solid and 0.373 for the melt. The latent heat of fusion is about 35 btu's per pound. Heat transfer coefficient at 800°F. and a flow rate of 6,000 lbs. per hour through a 1-in. tube is 858.

### Keep Away From Fuels

The nitrates used in the salt mixture are of course strong oxidizing agents. Both Dupont and Bethlehem maintain, however, that in the absence of foreign materials, Hi-Tec offers "no special dangers other than those inherent in any liquid at these high temperatures."

Attempts to detonate the salt mixture alone and when mixed with paraffin have failed both at room temperature and at 1100°F. In other trials where gasoline, gas oil, and crude oil mixed with sulfur were introduced below the surface of

molten Hi-Tec the hydrocarbons merely vaporized and burned. Analyses showed little chemical reaction with the salt.

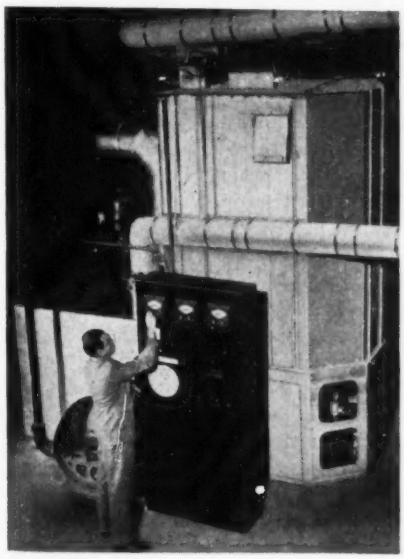
It is important, however, that wood chips, paper, rags and other easily oxidizable materials not be permitted to drop into the molten salt, for they will burn readily and evolve gaseous products of combustion.

### The Package

Work which led to the development of the Beth-tec unit began at Dupont in 1940. The earliest pilot model was built under the supervision of Drs. Wesley M. Nagle, W. B. Johnson and F. S. Chambers at the Eastern Laboratory of the company's Explosives Department at Gibbstown, N. J. Satisfied that the unit had commercial possibilities, the Dupont engineers approached Bethlehem Foundry in 1945 to see if that company would be interested in designing and fabricating a large-size unit. It was, and President Van Sciver immediately assigned his chief engineer, O. R. Fisher, and design engineer, W. R. Smith, the task of working out with the Dupont representatives the design for the present commercial package unit.

The Beth-Tec unit consists essentially of a furnace and salt circulating system. The furnace comprises a boiler complete with tubes, headers and manifolds for balanced salt flow, and adequate combustion space for optimum salt rates. Ordinary carbon steel is used throughout, as this is satisfactory for handling the molten salt up to 850°F., the recommended upper temperature limit for the unit.

Included in the salt circulating system is a sump tank, fitted with either a steam heating coil or electric immersion heater to melt the salt when the unit is started up. A submerged salt pump, packed with asbestos, initiates and controls the flow of the molten salt. Inspection manholes provide easy checking during operation.



**BETH-TEC UNIT: For process work high temperatures without pressure.**

The customer must provide the piping to attach the unit to the piece of equipment to be heated.

Two air-operated diaphragm-type salt control valves are located on top of the boiler. These are jacketed for steam heating. Heat is provided for the molten salt by a proportioning type of oil burner.

The instrument and control panel is separate from the unit itself. The "fail-safe" type of controls are used, and no human element is involved in operating the unit other than setting the temperature control at the desired point and pushing a button.

# WAX CONTENDER

**A new company, introducing several unique wax-based specialties, nudges the titans in its field, heads for national distribution.**

IF YOU were asked to name the field in which competition is the most rugged, you couldn't go far wrong by settling on the wax polish business. For there are major worries which any newcomer must hurdle before he stands a chance of succeeding in the rough-and-tumble of wax-making and wax-selling. First of all, there are several big-name brands (notably, Johnson, Old English, Simoniz) which, backed by large and merchandising-wise organizations, have corralled the lion's share of the national market. Secondly, there are thousands of smaller concerns, usually concentrating their efforts in a comparatively small region, who offer keener-than-average competition in their own bailiwicks.

### Double Recognition

All this A. S. Harrison knew when he plunged into the polish specialty field a scant two years ago. Now, his competitors are coming to know Harrison, for his originally one-man enterprise already boasts a $500,000 per annum sales volume, is adding two new items in the markets it is now serving, is rapidly moving toward national distribution.

Harrison is, in one sense, a newcomer to the polish business; in another sense he is not. His current organization, A. S. Harrison Co., which manufactures and markets Preen (a novel cleans-while-it-waxes floor finish) is but two years old. Nevertheless, it owes its birth to its founder's 25 years experience in making bulk floor finishes. The retailing company began as an offshoot of an older bulk-selling concern. Now it is an independent, flourishing small company.

### A Bet Overlooked?

It all began back in 1942 when A. S. Harrison, and his brother, R. W. Harrison, were running their jointly-owned Minwax Co. Their business: making finishes for flooring, which they sold

**A. S. HARRISON: Never aim at a covey.**

through contractors and architects. For years they had shunned the retail outlets, regarded such distribution as foreign to their set-up. One day, however, A. S. Harrison began to wonder if the company was missing a good bet. He had often heard contractors complain that they could buy good polishes, which wouldn't clean, and good cleaners which wouldn't polish. Why wasn't it possible to make a good combination cleaner and polisher, and if that were compounded, wouldn't the housewife welcome such a labor-saver?

Both brothers worried about the problem, appraised the prospects. Soon they developed a new item, tradenamed Preen—a solvent-based self-polishing wax (containing as much wax as the average compound of this type) and which, in addition, carried three cleaning agents. Cautiously they began to test market in Hartford, Conn. Sales were encouraging, so they moved in on the New York area. Preen was on its way.

### Cautious Launching

Then, however, a major policy decision had to be made. Was it advisable for the Minwax Co. to enter the consumer field? Could it do justice to both bulk and retail promotions? The brothers thought not. So it was that in 1945 A. S. Harrison sold his interest in Minwax to his brother, bought the rights to Preen. Within the month he was in New York, with an infant business and a staff of one.

Contrary to the course followed by a good many businesses, the Harrison concern has not hustled out to sell its product in every city and hamlet in the country. Rather, it has followed the policy of moving market by market, consolidating its advances, and moving on to a contiguous territory. Perhaps its character stems from an early experience of its founder. Years ago, Mr. Harrison was hunting quail. The first covey was flushed from a thicket, and only one bird hove within range. Harrison sighted on

the bird, fired, and it dropped. The next covey was in an open field. As the birds rose, Harrison aimed at the covey, hit not a single bird. His company now does the same. It never shoots at the "covey" but singles out the individual "bird."

### New Markets

At the moment, Preen is being sold by the 16-man company mainly in the New York city market. In recent months, however, Connecticut, New England, Eastern New York, Pennsylvania and the Washington area have been opened up. Some outlets are established in Chicago (Marshall Field) and others as far away as Los Angeles. Nevertheless, the company did not seek this far-afield business, nor does it plan any extensive exploitation of these markets for the time being. Worthy of note is the status Preen enjoys in the New York area, where it has moved up into number three position in the *Herald Tribune* Survey of Consumer Preferences.

### Skirting Antagonism

One unique feature of Preen's marketing is that it is not, as yet, sold through grocery stores. Harrison feels that a certain amount of antagonism exists between grocery and hardware merchants, so he confines his efforts to winning the support of hardware and department stores. Orders from major department stores are shipped direct; smaller retailers are serviced through jobbers.

A logical step, as soon as outlets were established, was to add companion items to the line. Last spring the company brought out K-T, an emulsion type self-polishing wax designed for use on asphalt and rubber tile floors, (on which solvents cannot be used). It contains no cleaning agent, and is suggested as an item for kitchen use, and for those "diligent scrubbers" who must, to satisfy their long-formed habits, scour a floor with soap and water, can't feel quite happy about using Preen's effective but easier method of cleaning. This fall, Wall Wax made its debut. Its purpose: applied to wallpaper it leaves an invisible, water-repellent film so that crayon marks, and the imprints of sticky little fingers, can be simply washed away.

### On the Docket

Right now, Harrison is planning further expansion. Additional newspapers will be carrying his advertising next spring and at least 6 more radio stations will share in the advertising appropriation. No country-wide jump is contemplated, however, but a gradual area-by-area march is obviously on the docket. And as Harrison modestly phrases it, "We expect competition, and we are only a two-by-four outfit, but somehow we feel that we will make out alright." Quail by quail, indications are that he will.

# SPARE THAT TREE

**The chestnut tree's imminent demise is turning tanners to synthetic and other natural tanning agents.**

JAMES THURBER writes that his Uncle Zenas caught the chestnut blight back in 1885 and died thereof. That was over 60 years ago, and the blight has rampaged ever since, killing off the trees at such a rate that there will be a serious shortage of chestnut tannins in 10 or 15 years.

### Falling Off Already Apparent

The leather industry—and the few other industries which use minor quantities of tannins — depends on imports for two-thirds of its 120,000-ton (100 per cent tannin basis) annual consumption of tanning materials. Quebracho accounts for

**FRED O'FLAHERTY: Rustling in the pantry.**

80 per cent of the imports; chestnut, for 85 per cent of the domestic materials.

But figures for 1942, when imports were seriously reduced and tanners were more than ever dependent on domestic supplies, show that chestnut wood contributed a smaller share (28 per cent) of the total than in 1939 (31 per cent). Balancing this was an increased utilization of oak and hemlock barks and blends of such casual materials as pecan shells.

It would not be objective to say that the alarming decrease was all due to the blight; for labor shortage in the woods contributed greatly to the decline. "With the cessation of the war, labor has been somewhat more available . . . but the situation is little if any better than it was," says Fred O'Flaherty, secretary of the American Leather Chemists Association. "The number of plants extracting chestnut has dropped and the available wood supply is diminishing. The chestnut is almost all dead . . . the industry is currently harvesting the dead stands in our southern Appalachian mountain areas. It seems only a matter of time until these reserves will have been exhausted, and it is not especially pessimistic to predict this exhaustion as being possible within ten or fifteen years."

### Replacements on the Bench

More imports is one solution. But quebracho, the most widely-used import, is reportedly controlled by a cartel which exploits the U. S. shortage to the utmost. Wattle bark, third in importance to quebracho and chestnut, is produced in Australia and South Africa, and the United Kingdom gets the lion's share of it as a result of Empire preference. Production in East Africa is increasing, but there monopoly—the quebracho cartel again—is rearing its unlovely head.

Latin America is producing more tannins, but the availability of those materials to this country is open to question. As Latin American countries become more and more industrial, a greater proportion of their raw materials will be consumed internally.

A more promising alternative, it seems, is the investigation of present and potential tannin sources in this country. Buttonwood, darling plum, and scrub oak, for example, grow in the South—especially in Florida—and are known to be suitable tanning agents. The dwarf sumac and two other domestic species of sumac have been evaluated, and utilization depends mainly on careful harvesting. Hemlock bark is in a similar situation in that the current practice of floating the logs in salt water lowers the tannin content and moreover contaminates it with salt. Redwood tannins are now being plant-evaluated, and the issue of these trials may open up an appreciable source of supply

### Taming the Tannins

The above materials are already on hand, but there is also the possibility of raising tannin-bearers as crops. Pecan shells, as mentioned before, were used during the war; and sumac is adaptable to cultivation. California is pushing development of its natural resources and is enthusiastic about the prospects of wattle as a cultivated crop. The state hopes to beat Brazil in the race to produce commercial quantities of the material. The Eastern Regional Research Laboratory has been investigating canaigre, a dock-like plant that grows wild in the arid Southwest. Its cultivation and harvesting over a one- or two-year period appears feasible. The root is a source of tannin—indeed, it was used at the turn of the century to make commercial leather—but the high proportion of carbohydrate hampers preparation of a pure extract. Now research men have found that a combination of carbohydrate fermentation and centrifugal extraction overcomes these difficulties.

Wallace's hybrid corn points the way to another solution: By the application of genetics it may be possible to develop strains that are especially rich in tannins

Such a development would go far to offset the cost of cultivation.

**Synthetics to the Rescue?**

Why worry about natural tannins? Why not use synthetic materials? The answer is that they are being used. Germany was the first to develop them, and good leather was produced in that country with synthetic tans exclusively. Many military leathers were tanned with blends containing up to 50 per cent synthetics, and use of a certain percentage was obligatory for nonmilitary goods. A condensed phenosulfonic acid type synthetic, made by the Rohm & Haas Co. and sold as Orotan TV, and Exan, made by Monsanto Chemical Co., are two domestically-produced synthetic tans.

Synthetics have the advantage of uniformity and the disadvantage of comparatively high cost. It is to be expected, however, that continuing research will develop materials and methods of use whereby equivalent leathers may be produced more economically, or superior leathers be made that are unequalled by natural tannages. There is also the possibility of using synthetics in conjunction with low-grade tanning materials such as sulfite waste liquors to produce a cheaper product.

All of these possibilities are now being looked into by the leather industry against the day when the last chestnut tree yields up its tannins. There is nothing like the prospect of hunger to incite a furious rustling in the pantry.

# TRAVANCORE TUSSLE

**The panjandrum of Trivandrum stages a holdup on titanium ore, but Du Pont doesn't play that way.**

LITTLE Travancore, slightly smaller than New Jersey and slightly more populous, apparently keeps an eye on American newspapers. This small state, on the southwestern coast of India, is commercially important because of the black ilmenite (iron, titanium, oxygen) sand along its beaches. The prime minister has undoubtedly read about the U. S. construction boom and the accompanying demand for good white paint, for he has refused to grant export licenses on this year's output until he can get a higher price. And just last month Du Pont upped pigment prices 1¢ a pound.

**Same Old Story**

Paintmakers in this country, who have depended to a large extent on Travancore's exports had a "this is where I came in" feeling, for the prime minister held up shipments last year, although for a different reason. Then he wanted a pigment plant, and wouldn't ship any ilmenite until British Titanium Products.

**TRAVANCORE: "Who'll buy my ilmenite?"**

Ltd., built one for him. It is only a 5-ton-per-day plant, but it settled the quarrel.

Then, during the partition riots the prime minister was stabbed. Another one replaced him, but he is no easier to deal with.

**Florida is More Tractable**

Finally E. I. du Pont de Nemours & Co., which depended largely on Indian ilmenite for its titanium pigments, decided to cut itself loose from Travancore's uncertain apron strings.

A long-term lease of ilmenite-bearing lands has been obtained by the company from the state of Florida. The lands are in the north central area of the state and are state-owned. The company is now in the midst of engineering studies, preparing to install large-scale mining equipment on the site.

The Florida land is probably the second-best ilmenite source in the country. Biggest source is in New York's Adirondack Mountains, where National Lead Co. mines over 200,000 tons of titanium concentrate annually. National Lead has also processed Indian material.

National Lead, incidentally, has just announced its intention—to be acted upon immediately—of boosting the capacity of its ilmenite ore mine at Fredriksstad, Norway, by 50 per cent.

New titanium plants now being built will add about 25 per cent to present capacity early this year, so—with or without Travancore—American houses will still be titanium-painted.

# BRICKS OFF THE WALL

**Tariff reductions effective January 1 are a small breach in the barriers to free world trade.**

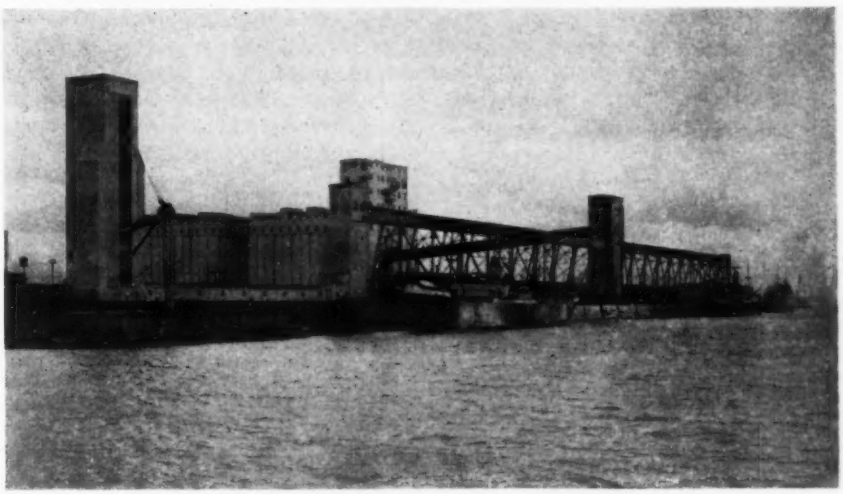
UNCLE SAM, true to his ineluctable habit, gave more than he got when he lowered tariffs the first of this month in accordance with the Geneva agreement. Concessions were granted by other nations, it is true, in return for U. S. reductions; but the agreement allows import restrictions by any signatory nations who have difficulty in paying for unfavorable trade balances—and who doesn't today?

In the immediate future hardly any effects of the tariff cuts will be perceptible. There will be no sudden influx, for instance, of imported chemicals. Most exporting countries—Great Britain is a good example—are doing all they can in any case to increase sales to America. Lower duties can hardly spur them to greater effort when they are already exerting themselves to the utmost.

Neither can one expect lower prices. The same basic need (i.e., dollars) that goads exports also necessitates prices as high as are consistent with domestically-produced competitive products. The loss of duties will mean just that much added revenue to Europe's—indeed, the world's—dollar-hungry nations.

**Big Stick Walking Softly**

The agreements were also the occasion for a little political club-swinging. Presi-



**NEW ORLEANS PORT: Customs men get a new rule book.**

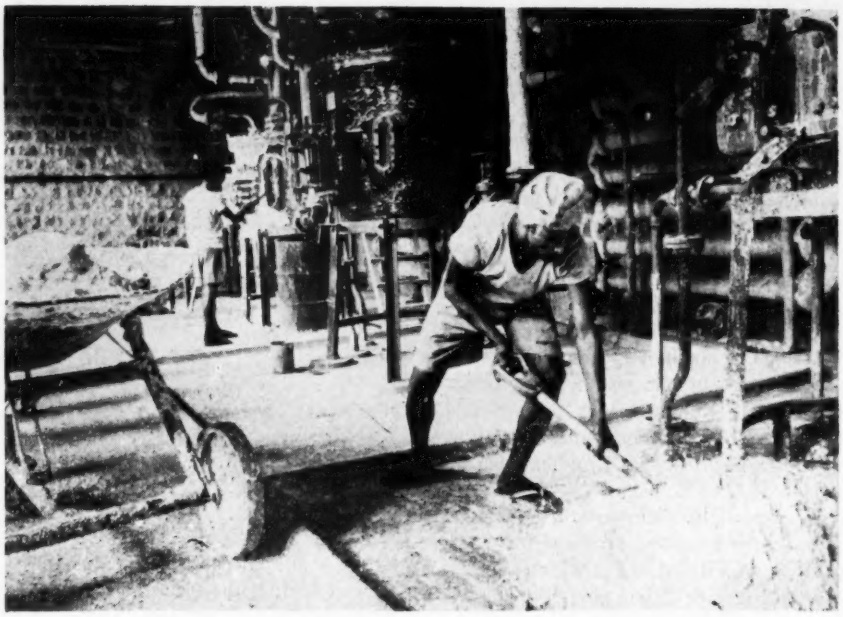
dent Truman announced that some of the cuts would be deferred until later—on items which were of special interest to nations that hadn't signed as yet. The duty reduction on sugar, for example, was deferred because Cuba hadn't OK'ed the agreement. Less than a week later Cuba and the U. S. came to a separate agreement, the sugar tariff was reduced as of January 1, and Cuba made 497 tariff concessions on imports from the U. S. It is expected that all deferred cuts will be put into effect by June 30, deadline for signing the agreement.

### Coal Tar Competition

From the long-range point of view, the 50 per cent cut in duties on many coal-tar chemicals is of greatest consequence. This concession is mainly for Great Britain, a major supplier of coal-tar products for world trade.

Especially serious would be a revaluation—now being considered—of imports on the basis of the exporter's value rather than on the importer's. Such action would result in even less tariff revenue, and would undoubtedly result in an upward revision of duties.

Cynics scorn the Geneva agreements as having shackled world trade with more restrictions while it set out to do the opposite; but whether that criticism is valid or not will only be proved by experience. Free trade, like disarmament, is a fine idea—providing the other fellow does it first. At the very least, perhaps, the nations are starting to think about curing the sclerosis in the arteries of world trade.



INDIAN CHEMICAL PRODUCTION: From a primitive land, a Macedonian call.

# KNOW-HOW NEEDED

**India drafts a five-year plan for industrial expansion, seeks U. S. chemicals, equipment and know-how.**

WHEN the 150-year-old British rule of India ended last fall, a good many U. S. business men cast appraising eyes on the newly-independent country, wondered what course the administration would follow regarding industrialization and exploitation of the country's extensive but long-dormant resources.

Chemical men, in particular, eyed the prospects closely, for few countries in the world appear to offer a potentially greater, and largely untapped, market for U. S. chemicals than does India.

At the moment, U. S. exports of chemicals to India is the fastest growing phase of the increasing trade between the two countries. The value of cash purchases for Indian account has increased from 1938's paltry $3,494,000 to $18,148,000 in 1946. The character of these imports has changed, too. In the prewar year, U. S. imports were made up of: medicinals and pharmaceuticals, $1,429,000; industrial chemicals, $286,000; coal tar products, $246,000. In the 1946 period, medicinals has pushed up to $5,708,000, industrial chemicals had risen to $1,151,000 and coal tar products had reached $8,280,000.

### British Dominance

At the moment, too, India's own chemical industry is minuscule, and only recently did its invested capital exceed $15 million. (The textile industry, on the other hand, boasts a $300 million stature with iron and steel running close to that figure). Nevertheless, in the past few years chemical output has been vastly increased. Sulfuric acid production, for instance, has risen from a prewar 26,000 tons to over 80,000 tons, nitric acid tonnage has quintupled, hydrochloric acid has expanded eight fold, and soda ash, which was nil in 1939, now stands at 50,000 tons.

Indians are inclined to blame British rule for the backward state of their chemical industry, claim that in no other field (with the possible exception of shipping) did the British-run administration so strongly favor United Kingdom interests. Low or practically non-existent tariffs, an unhealthy interest displayed by universities in academic subjects to the detriment of scientific and technical education, high freight rates maintained by the railroad systems, and failure to grant any kind of protection to the indigenous chemical industry—all are reasons adduced in support of the complaint that the growth of the Indian chemical industry was stunted.

### New Legislation

Part of this trouble, some Indian industrialists maintain, arose as a result of one of the provisions of the Government of India Act, under which the country was governed until last August. Therein it was specified that no protection could be given to any Indian industry without its being automatically extended to any British company which established a subsidiary in India. Thus it was not possible for the Indian legislature to give any aid to the infant indigenous chemical industry without simultaneously according it to British concerns, such as the powerful Imperial Chemical Industries (India), Ltd. The odds are that the newly-created legislature will cancel this provision.

### Tariff Hurdles

As yet, at least, British chemical products imported into India enjoy a favorable tariff rate when compared to chemicals which originate in other countries.

With the implementation of the Marshall Plan it may be expected that free convertibility would again be restored by the United Kingdom. Nevertheless, Great Britain will continue to enjoy one advantage over the U. S. with respect to Indian chemical trade, specifically the fact that subsidiaries of British companies have acquired a rugged position in the import business. Obviously, if Indo-U. S. trade is to be fostered, U. S. manufacturers must establish close contact with Indian importers.

### Concrete Plans

One of the more important developments from a commercial standpoint was the recent appointment by Pandit Jawaharlal Nehru, Indian Prime Minister, of a special panel of business men to study the possibility of boosting India's chemical output. Although the government has been too busy in recent months coping with other pressing problems to announce its considered verdict, it may be taken that the panel's report will be essentially accepted and implemented. Set up are fixed targets to be attained within the next five years, which, in the overall,

means a quadrupling of the industry's size.

Of importance, too, is the recommendation that the establishment and expansion of new facilities for chemical manufacture should be left, in general, to private enterprise. It is suggested, however, that the government of India, and other local administrations, might contribute a share of the capital needed when sufficient private funds are not forthcoming or when it is considered desirable from the standpoint of national interest that the government have a voice in the running of a particular industry. It is anticipated, moreover, that the government will facilitate expansion by waiving duty on imported equipment and raw materials and by affording tariff protection.

### The Main Points

Here are the main points of the five-year plan:

*Sulfuric acid:* Present capacity of 100,000 tons to be increased to 152,000 tons. New plants are to be erected in Madras, Bombay and Bihar. (Most of India's 45 sulfuric producers are antiquated chamber units; emphasis will be placed on the construction of contact facilities.)

*Aluminum sulfate:* Present production of 17,000 tons to be boosted to 38,000 tons. Raw materials are available domestically and tariff protection is proposed.

*Sodium sulfide:* Present production: nil. Imports total 3,700 tons. A 7,000 ton unit is to be erected in the Jodhpur State.

*Soda ash:* Capacity to be raised to 270,000 tons by erection of two 50,000 ton units and two 30,000 ton plants.

*Caustic soda:* Present 12,600 ton capacity to be raised to 133,000 tons. One 11,000 ton mercury cell unit is to be located in Bihar, others in different parts of India. Some 30,000 tons of DDT and benzene hexachloride will also be made from the chlorine produced.

*Ammonium chloride:* Present production: nil (consumption 2,000 tons). A 4,000 ton plant proposed.

*Calcium carbide:* Present production: nil. One 5,000 ton factory is being built in Bihar, another 2,500 ton unit projected in South India.

*Urea:* No present production. A 10,000 ton project is to be installed at Sindri in Bihar.

*Superphosphates:* Target is 100,000 tons. Also to be studied: phosphorous research conducted by TVA.

*Ammonium sulfate:* During 1946-47 Indian imports will total about 180,000 tons of which 70 per cent will be through I. C. I. at $72.00 per ton. Domestic output: approximately 20,000 tons. A unit to yield 350,000 tons of sulfate is being built in Sindri. Capital investment will total about $30 million, of which $13 million will be spent outside India for equipment and engineering services. It is being financed by the government, and will be operated by it. Initial production is scheduled for 1950-51. Estimated cost per ton: $34.00.

Another major venture is Fertilizers & Chemicals (Travancore), Ltd. Already in production, it has a capacity of 50,000 tons of sulfate, adding a 60,000 ton superphosphate unit.

### Upward, Despite Obstacles

Those are the highlights of India's plans and aspirations, which point up the aggressive policy which the new government will follow in the development and protection of a domestic chemical industry. Moreover, although no direct statement has been made, it is probable that no special concessions will be given to Britain in preference to the U. S.

In the past few years, and despite a multitude of obstacles, India's imports of U. S. chemicals has mounted steadily. There is certainly no reason to believe that the trend will not continue. Indeed, from all present indications, U. S. chemical makers, manufacturers of equipment, and suppliers of engineering services, can expect to harken to many more calls from that industrially-awakened nation.

# WESTERN PHOSPHORUS

**Westvaco's plans for an electric furnace plant in Idaho herald first Western production of elemental phosphorus.**

THE SLEEPING giant of western phosphates gave another stir last month when Westvaco Chlorine Products Corp. of New York announced plans to build an electric furnace elemental phosphorus plant near Pocatello, Idaho. The first in the West, the plant will be located almost in the center of the vast stretch of phosphate lands—still largely undeveloped—that reaches from Montana down through Idaho and Wyoming into Utah.

The site on which the furnace will be erected immediately adjoins the fertilizer operations of the J. R. Simplot Co., and arrangements have been made to obtain phosphate rock from leases held by Simplot in the Fort Hall Indian Reservation some thirty miles from Pocatello. The Idaho Power Co. will supply hydroelectric power on a long term contract. The furnace, a modified TVA design, is expected to be completed early in 1949. The company may put in additional units if conditions warrant, but it states it has no definite plans of this nature at the moment.

### By Tank to New Jersey

Initially the phosphorus will be shipped in tank cars to Westvaco's plant at Carteret, N. J., where it will be burned in existing facilities to phosphorus pentoxide and phosphoric acid, starting points for the myriad commercial compounds of phosphorus. Eventually, however, the company plans to install phosphorus-burning equipment at its new Westvaco, Wyoming, operation, where it has started the mining and processing of natural soda ash. Soda ash is required for the production of all of the more important industrial phosphates.

Although a newcomer to the ranks of the elemental phosphorus producers, Westvaco is no novice when it comes to phosphates.

### 15 Per Cent in Phosphates

As a matter of fact the company lays claim to being the first U. S. producer of commercial phosphates. Dr. Lucien C. Warner, founder of the old Warner Chemical Co., Westvaco's predecessor, became interested in a deposit of phosphate rock off the shore of French Guiana in 1891. Bringing some of the rock to New York, he and an associate, Harris S. Hayden, developed a successful process for making trisodium phosphate and leased a small plant to manufacture it on the Harlem River in the Bronx.

Today phosphates* comprise about 15% of Westvaco's total sales. The company approximately doubled its phosphate-producing facilities in 1946, and in 1947 completed a plant for the new pesticide, hexaethyltetraphosphate, at its South Charleston, W. Va., works.

Elemental phosphorus is at present being produced only in the East, using rock from the Florida and Tennessee deposits. The major producers are Monsanto Chemical Co., Victor Chemical Works and the Tennessee Valley Authority, with Oldbury Electro-Chemical Co. and American Agricultural and Chemical Corp. having smaller-scale operations. Total production in 1946 is estimated at 80,000 tons, of which 19,763 tons was made by TVA. This compares with a wartime high of 85,035 tons in 1944.

### Production Pattern

Currently the Tennessee deposits of phosphate rock are running low and phosphorus manufacturers in this area are eyeing the Florida lands, where substantial reserves still exist. For manufacture of the phosphorus itself, however, Florida is at a disadvantage compared with Tennessee and the West on power costs. From the standpoint of reserves, the Western states are best situated, although most of the deposits there are still relatively inaccessible. The latest (1940) figures on reserves, in millions of long tons of rock, are Idaho 5,736, Florida 5,081, Utah 1,741, Montana 391 and Tennessee 195. The amount of rock mined in 1945 was 5.4 million long tons and in 1946 an estimated 7 million long tons.

Although it may take many years for it to reach the scale of the Florida operations, there are definite signs that a Western phosphate industry is in the making.

* Acid sodium pyrophosphate, disodium phosphate, sodium tripolyphosphate, tetrapyrophosphate and miscellaneous phosphates.

# GERMAN CHEMICAL INDUSTRY
## Capacity High, Recovery Slow

by NORMAN A. SHEPARD, Technical Coordinator
American Cyanamid Co., New York, N. Y.

**THE AUTHOR EXAMINES THE PRESENT STATUS of Germany's chemical industry, interpreting it in the light of European chaos and Big Four policy.**

MY TRIP to Germany was undertaken with the primary objective of getting a general picture of the chemical industry and its potentialities for assisting in German—and European—recovery. I also wanted to ascertain the possibility of procuring chemicals from Germany—especially in the dyestuffs and intermediates field; to look into the situation with regard to postwar research and development; to examine the possibilities of getting American rights under inventions resulting from such research; and to establish—in some instances, re-establish—contacts with German scientists and industrialists.

In the course of my trip I visited the most important chemical centers in the American, British, and French zones; the former I. G. Farbenindustrie plants at Heochst, Mainkur, Offenbach, Griesheim, Leverkusen, Elberfeld, Troisdorf, Huls, and Ludwigshafen; also Wiesbaden (Chemische Werke Albert and Kalle & Co., A. G.), Essen (Th. Goldschmidt A. G.), and Ludwigshafen (Knoll A. G.).

### CAPACITY HIGH

I was very much impressed by the comparatively large amount of chemical capacity that had escaped bombing. At the same time, I was quite disappointed by the lack of progress in rehabilitation and use of the facilities. Many chemical products—not in the armaments category—could play a legitimate part in economic recovery, both as essential raw materials for reconstruction and as items of trade to provide dollar balances or needed materials by barter and exchange.

The large plant of Farbwerke Hoechst, for example, was only slightly damaged, as was the important intermediates plant, Chemische Fabrik Griesheim. Three-quarters of the latter, however, had been taken over as an ordnance depot. Naphthol-Chemie-Offenbach and Leverkusen were each damaged to the extent of 25 per cent. The Ludwigshafen-Oppau plants, on which were dropped some 15,000 tons of bombs, lost 40 per cent of their buildings and equipment; and Dynamit A. G. Troisdorf lost 30-40 per cent. Both, however, could still produce large quantities of products if they were operated near their remaining capacity.

Of the plants I visited, only the Goldschmidt plant at Essen and Knoll A. G. at Ludwigshafen were in hopeless condition. The former was 80-90 per cent destroyed. Chemische Werke Albert, too, was in bad shape from bombing and general deterioration.

I have estimated these figures only from casual observation—sometimes only a bird's-eye view of the plant exterior or an impression gained by driving or walking through the yards—but these impressions checked very closely with the figures given me by the plant managers.

### PRODUCTION LOW

I obtained very few specific production figures, but I did get a general picture of dyestuffs output. From all I could find out from J. E. I. A. (Joint Export-Import Agency) headquarters at OMGUS-Berlin (Office of Military Government-U. S.) and from talking with plant managers, both production and inventories on these chemicals were very low at the time I was there in spite of quite large estimated capacities for these materials: 2,100 tons per year at Leverkusen; 6,200 total at Hoechst, Mainkur and Offenbach; and 4,700 at Ludwigshafen.

At Leverkusen, for example, I was told that the total export business had amounted to only approximately a million marks in value since the end of hostilties two years ago. According to J. E. I. A.-Wiesbaden, practically no dyestuffs had as yet been exported from the American Zone—just a few small shipments. Contrasted with these figures are those for the prewar export business of the Offenbach plant alone, which I was told amounted to 20-30 million marks per year, or approximately $15,000,000.

At the time of my visit I felt that in the American Zone there was full realization of the potentialities of the chemical industry in bringing about the economic recovery of Germany, and I was led to believe that the current policy of OMGUS was to utilize this means to recovery in so far as possible. The low production of chemicals, however, left much reason for speculation of this point.

### TRUST-BUSTING

I found that some Germans felt that there was much evidence of the opposite intention, i.e., to destroy the chemical industry so that its competition in the world markets would be practically negligible and so that the United States, Britain, France and the U. S. S. R. could capture the world market formerly held by the Germans. One German pointed to the dissolution of the I. G. as evidence of this; I pointed out that the dissolution of the I. G. was no indication of a policy by the victors to destroy the German chemical industry. My opponent was not convinced. The German chemical units in I. G., he said, were so closely knit and correlated that the industry as a whole could never recover in separate units. The purpose of the occupying nations was clear to him: to reduce Germany to an agricultural country—the Morgenthau plan, ostensibly rejected as a policy, but subtly adhered to and introduced sub rosa.

One indication to me that there may have been some grounds for a belief that we originally set out to destroy the industry was the condition I observed at Chemische Fabrik Griesheim—a condition that was created at the start of our occupation and has grown worse, rather than improved. Here was a plant, manufacturing chiefly chemical intermediates, upon which many other chemical plants in Germany depended. As I got the story, this plant was almost immediately slated for reparations or destruction on the basis that nitrotoluenes were manufactured there; and having some fine

buildings suitable for warehousing purposes, Ordnance moved in and cleared approximately one-third of the factories of fine chemical equipment, with no care or thought of preserving it. Some of this is still strewn along the roadway opposite the plant. I was told that much of the equipment of this plant was ripped out, dumped in a pit and buried by bulldozers! Later more of the plant was requisitioned by Ordnance, until now only approximately 20 per cent remains for chemical operations, and this is so hampered by the traffic and outdoor storage of ordnance that it can operate only very inefficiently. And I was told that the Army wished to take another "bite" by commandeering a remaining section of the plant which formerly manufactured electrodes for electrolytic processes—the only plant in Germany so equipped. I was given to understand that our Military Government had stepped in to prevent this.

Whatever the facts are in the above case, the entire procedure was certainly very damaging to the recovery of the German chemical industry and indicative of a policy of destruction; if not a policy, then an ill-advised action.

### HANGING SEPARATELY

Partition of Germany into four zones has had an especially detrimental effect on the chemical industry, which depends so much on the free interchange of materials within a country. The economic merger of the U. S. and British zones has markedly improved the situation; but since the Russian zone contains 51 per cent of the chemical productive capacity, the picture is still far from bright. Obviously, even in the other three zones each occupant wishes to make the best of the materials available in its own sphere, with the result that intermediates do not flow to other zones if there is capacity for working them up in his own zone. However, there would seem to be little excuse for Russia to offer phenol for export to America, when other zones were crying for phenol as an intermediate. If we here in America found ourselves with our country partitioned as Germany is, our chemical industry would soon be a sick and unprosperous one. Until this situation is corrected by a deep-seated reorganization of the entire set-up of the control of Germany, with Russia cooperating, I have little hope that the chemical industry will play a major part in recovery.

### REPARATION RESULTS

While the German chemical industry was undoubtedly greatly expanded before and during the war—expanded beyond normal peacetime needs—the overall productive capacity was certainly trimmed back very considerably by the bombing; and, as I understand it, munitions capacity has been annihilated by demolition.

Further limitation by dismantling and assigning for reparations seems questionable, even when it may appear that excess capacity for a given chemical remains. Retention of such plants, or at least of the equipment, would lead to better utilization than shipping the plants out of Germany with the idea of reassembling them elsewhere. Such plants, in new locations, rarely prove satisfactory unless the operating personnel, with complete "know how," go with it. Even then maintenance and repairs are difficult, costly, and unsatisfactory due to lack of international standardization of parts and like obstacles.

Left in Germany, much of the chemical equipment, such as autoclaves, distillation columns, presses, vats, tanks, etc. could be installed in production lines for new processes or for replacement.

I have never seen a list of the chemical plants that are slated for reparations, but I noted with disappointment, in the press, that certain of the plants at Leverkusen were so cataloged.

### COAL SHORTAGE HITS HARD

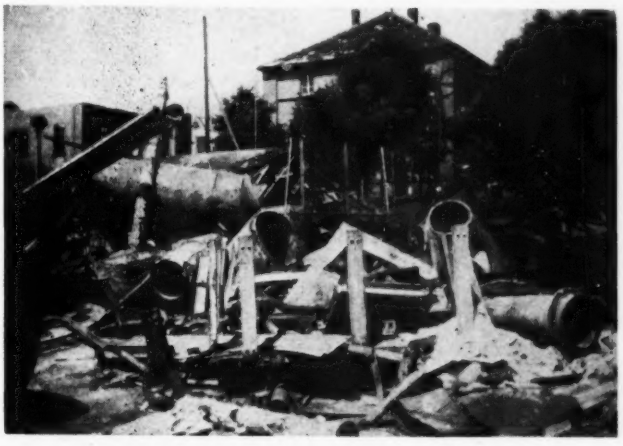
I was surprised that the allocation of coal to the chemical industry had been so small. Whether this industry got its proportionate share or whether it was discriminated against, I do not know; but I was quite shocked to learn that the manufacturing departments of Farbwerke Hoechst were completely down from November, 1946, to May, 1947, chiefly because of lack of coal. I was told in June that while their manufacturing was then running in pretty good shape, they had only one-half their normal requirements of coal. At Naphthol-Chemie-Offenbach the plant manager said that while they had sufficient coal for their operations in March, April, and May, 1947, in June they were getting only one-third to one-half of their needs, and by July they might have to shut down for lack of coal. Even near the Ruhr, at Leverkussen, which I visited for the second time in June, I found the plant shut down for a month.

### NO FOOD, NO WORK

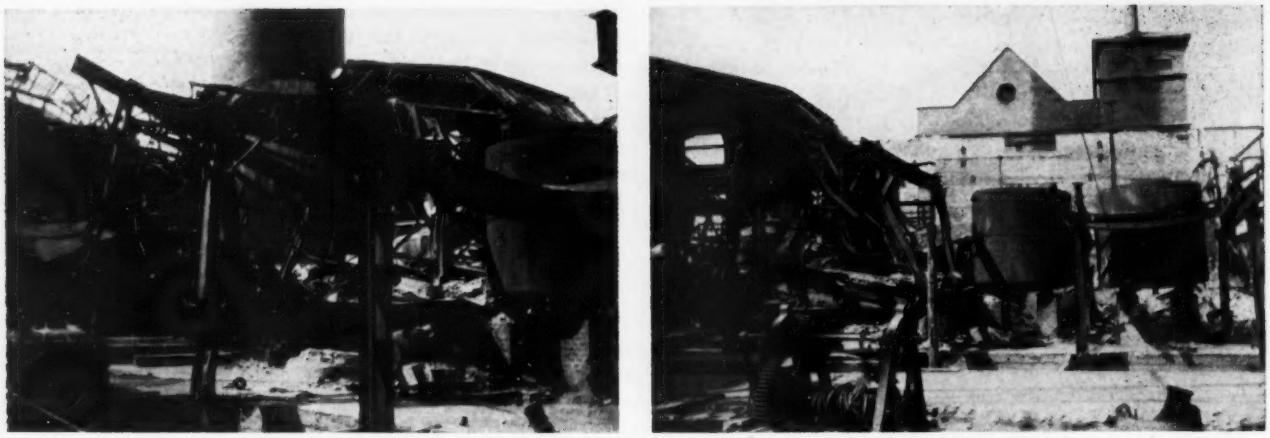
Labor shortage—especially of trained labor—was repeatedly pointed out as a cause of the low production of chemicals. It is not only a question of quantity of labor, but of the low efficiency of that which they do have. Many plant managers stressed low efficiency of their manpower, estimating it at 50% of normal. This was attributed to the lack of food—both as regards quantity and nutritive quality. To the low protein content of their rations, as well as the caloric allotment, was attributed their inability to produce efficiently. They lack the energy to do hard work.

Absenteeism is very high, and the reason is not far to seek. While clothing and shelter are extremely serious problems to the Germans, these are quite secondary to food, especially in the warm months. The food problem is number one throughout the year.

This, taken together with the facts that the rationed food is reasonably priced and they therefore do not have to work at their jobs daily in order to earn enough marks to purchase it, leads to much absenteeism. During the spring and summer months the worker absents himself, usually without notice, and takes to the fields to raise for himself and his family



**Equipment ripped out of the I. G. works at Griesheim is scattered in an open lot and along the road outside the plant.**



**The bomb-damaged Naphthol-Chemie plant at Offenbach still looked like this in June, 1947.**

additional food beyond his rations. Also, when he just feels tired of a morning, from under-nourishment, he may decide to stay home and rest. We from America would say, work and save your marks for a rainy day, or for later, when food and clothing become more plentiful. But the German doubts that day is coming for a long, long time. And they have little confidence in the value of a mark. It buys little now, and may be next to worthless later.

High absenteeism is a particularly serious matter in the chemical industry, where so many operations are continuous, where it is extremely hazardous to substitute inexperienced help for an experienced absentee, and where operating with an incomplete crew may lead to an accident, or off-quality product. Absenteeism plays havoc with both quantity and quality of product. The plant manager at Naphthol-Chemie-Offenbach told me of an instance illustrating how difficult it is to operate with labor so independent and unreliable in attendance. At long last they had assembled equipment for a process in a department that had been heavily bombed. The first run was scheduled for a certain morning and nine men were told to report to start the run. Three showed up!

Most of the plants visited were operating with a much smaller number of employees than normal; and 'way below the number that corresponds to the percentage of plant facilities that escaped destruction.

## QUARANTINE FOR NAZITIS

At the time I was in Germany practically all the out-and-out, or upper-stratum, Nazis had been removed from office, and most of the people whom I met had not been members of the party—or, if they had been, had been denazified or cleared to continue in their vocations. I did, however, come into contact with several whose records were considered questionable and who were still "under the cloud," and fearfully awaiting the verdict of the Denazification Board. Also, I made a special point of visiting an ousted official of Hoechst, who had been a member of the Nazi Party and whom I was urged to see by mutual friends on the faculties of the Universities of Heidelberg and Frankfurt am Main.

This particular man, and I am sure there are many others in like situation, had real experience and potentialities for assisting in the revivification of the chemical industry, but I found him living in a small third-floor apartment, shorn of his salary, his fine house that was formerly provided by I. G., and of his means of livelihood. No laboratory, chemical equipment, or chemicals were available to him, even for personal investigation; so he is a complete loss to the industry. It seems to me that the lesser of two evils would have been to utilize him in the recovery program. Under rigid observation of the Bizonal Control, it would seem a wise and safe move to use such men.

## PATENT PROTECTION NEEDED

The beneficial effect that the reopening of the German Patent Office would have was discussed with several in the Office of Military Government, and there was general agreement on the importance of getting the patent system working again.

At the time I was in Berlin I understood that prompt reopening was being given serious consideration, though there was grave doubt that it could be accomplished until the peace treaty was signed.

Inability to protect their postwar developments and discoveries by patent applications obviously makes it impossible for German scientists to discuss such discoveries with prospective purchasers of patent rights in foreign countries, with the result that this negotiable asset of the chemical industry is frozen. It would be a great stimulation to invention if this condition were changed. Also, royalties from assignment of patent rights could mean a substantial income, and such license fees from American firms could constitute a substantial addition to Germany's dollar balance.

The passage of Public Law 380, Section 3, by our 80th Congress is an important step in ameliorating the situation, by authorizing German Nationals to take out U. S. patents upon inventions made after January 1, 1946, subject to any conditions, limitations, etc., that may be imposed by Congress or the President in accordance with the provisions of the peace treaty. A considerable number of U. S. applications should result from this authorization, unless the provisos discourage applicants, who may prefer to wait until they know the extent of the patent protection.

## SICK SCHOOLS

I learned a good deal about the educational situation from professors with whom I talked. I did not visit the University of Berlin, but its physical status was described to me, and from that it would appear that it is almost a negligible factor in the educational system. The University at Frankfurt, practically ruined by bombing, is almost at a standstill and cannot become effective for a long time. I was told there that denazification had depleted its staff of practically all its younger faculty, for it was this group that succumbed to the Nazi influence in order to obtain standing, membership on military scientific committees, etc. These men were the backbone of the future top faculty—the aggressive leaders—and there is little hope, without them, of recruiting a good teaching staff.

All in all, the German industry is failing to contribute to European recovery. In part this is due to design: the stipulations of the Level of Industry edict. But beyond this, the chemical industry is anemic, lacking not only the life-blood of materials and coal but also the facilities in which to work and the manpower to work them. The chemical industry is but a microcosm of the vast European chaos, and only as each segment is put into repair—by investment of capital, policy changes, Big Four agreements, or whatever steps are necessary—can the whole be made to operate. Dependent as almost all branchs of industry are upon chemicals, an adequate supply—both as regards kind and quantity—is fundamental to recovery.

# How to Avoid Losses in COMPRESSED AIR SYSTEMS

**IT COSTS GOOD MONEY to operate compressed-air equipment at sub-standard pressure. Causes should be ferreted out at once and corrected.**

THE SIMPLICITY and effectiveness of agitation of liquids by compressed air explains its widespread use in the chemical field. Usually, an air line is run along the bottom of the tank, where the lower side of the pipe is perforated at intervals to release air pressure. No investment of mechanical apparatus is required, and harmful effect of many acids on mechanical apparatus is eliminated. An application is illustrated in the illustration.

Similar applications are found in other industries, including the small tanks of solution used by garages and machine shops for cleaning metal parts.

Pumping water and chemical solutions, or elevating and transferring them by pressure, are other common applications for compressed air. Tanks and pipelines are caulked by air hammers and air pressure is applied in testing them.

The power of one compressor is frequently applied to a number of entirely different types of operations, and standard equipment is available for virtually every requirement.

### LOW AIR PRESSURE

By "low air pressure" is meant inadequate pressure at the device which is air-operated. It is at this point that the air is used as power; only the pressure and volume of air available at the point of use can be effective in doing work.

When it is discovered that pressure is too low, the first inclination is to install more compressor capacity. This is not necessarily the correct answer. It should first be determined whether the compressors are at full load when the air pressure is low. If they are, then more compressor capacity may be required; but even then consideration must first be given to two other common causes of low air pressure.

The second cause is "inadequate piping." A measure of the adequacy of piping is the pressure loss between the air receiver, where the compressor endeavors to maintain a constant pressure, and the point of use. This should not exceed 10 per cent in a well-designed system. The absolute maximum drop for the worst point in the system should not exceed 15 per cent. If the pressure drop is greater than 10 per cent average, 15 per cent maximum, throughout the entire distribution system (including hose), then attention should be given to correction of this fault before considering increased compressor capacity.

A third cause of low air pressure is leakage or loss of air without doing work. It has been pointed out that permitting excessive leakage is the same as exhausting the output of a compressor directly at atmosphere. The gas industry considers a loss of more than one cubic foot per minute per mile of 3-inch line as excessive.

### THE REMEDIES

The remedies for low air pressure are just as definite as the causes and effects.

Faulty air power conditions are usually due to poor planning or to increased air uses without corresponding system expansion. Plant-wide analysis should determine the full extent of low air pressure and the present air flow requirements. Future growth must also be considered.

Methods of increasing pipe line capacity to decrease pressure loss and improve conditions at the point of use vary with different installations. One may call for a line paralleling the original, with frequent interconnections; another may require installation of a loop system with some outlets taken off the new line to relieve the old; still another may need a complete new system. Branch lines and manifolds for attachment of equipment should be planned "oversize."

Not the least of the problems of correct system layout is the selection of proper hose for final transmission of compressed air to the operating device. Losses of 15 per cent to 25 per cent in air pressure are frequent in the hose alone. One should not use a hose longer than is necessary.

Every cubic foot of leakage eliminated is pure gain. Such losses in many systems will reach 10 per cent to 20 per cent of the total air compressed. An air leakage test should be run on the complete plant and every section of hose should be inspected. Although leaks are usually small, they may be numerous, having a high total effect. A single 1/16" hole will waste 182,000 cu. ft. per month, costing $9.10.

The most likely locations of small leaks are around valve stems, in hose connections, unions, drains, "homemade" devices, and lines leading to inoperative equipment.

Elimination of leakage involves making the system tight, then keeping it tight.

Only after it has been determined that the distribution system is inadequate and that leakage has been eliminated, should increase in capacity be considered.

**Here sulfuric acid, diluted with water, is agitated by pressure from an air line along the bottom of the tank. Churning of the mixture is noticeable in the left foreground.**

Based on information supplied by the Compressed Air and Gas Institute, 90 West St., New York 6, N. Y.

# Centrifugals Replace Tables for Separation of Starch

by ROBERT L. TAYLOR, Editor, Chemical Industries

**"THE MOST SIGNIFICANT process change in the corn starch industry in 25 years" is how one producer has described the replacement of starch tables by centrifugals for the primary separation of starch and gluten. Here for the first time is a case record of how the centrifugal process operates and some of the results that have been achieved.**

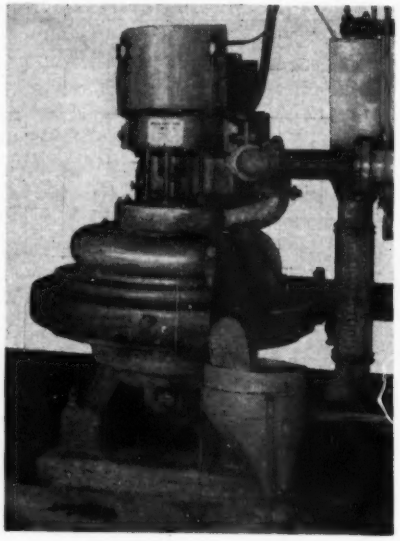
A NUMBER of years ago Albert Peltzer, then an engineer with Corn Products Refining Co., had an idea that there ought to be a better way than the age-old starch tables to separate gluten from starch in the manufacture of corn starch. The long tables, which operated on the principle of gravity separation, took up a tremendous amount of space. They were slow, messy, and recovered only about 85% of the starch from the water-starch-gluten suspension that passed over them. Why not, reasoned Peltzer, step up the separating force—and thereby the whole operation—by some mechanical means, such as centrifugation?

Largely as a result of Peltzer's efforts, the first commercial installation of centrifugals for recovery of starch was made in 1932, at the plant of the A. E. Staley Co. in Decatur, Ill. It employed a new centrifugal called the Merco, developed for the purpose by Peltzer and a mining engineer named Harrison S. Coe and built by the newly formed Merco Centrifugal Co. of San Francisco.

Instead of actually replacing the starch tables, however, as originally envisaged by Peltzer, the early centrifugal installations were used only on the tailings from the tables as a "polishing" operation to increase the total recovery of starch and to obtain a very high-protein gluten. This use proved so successful that centrifugals were soon installed by all of the major corn starch producers for polishing, and machines for the purpose were sold by the Sharples Corp. and the DeLaval Corp. as well as Merco. Centrifugals also came into use for the separation of wheat starch.

### FIRST PRIMARY SEPARATION

But not until ten years later—in 1942—were centrifugals first used in place of tables for the primary separation of corn starch and gluten. This first installation for primary separation was at the plant of the Hubinger Co. at Keokuk, Iowa, using the Merco machines. Since then the National Starch Products Co., Inc.,



**A Merco centrifugal of the type used for continuous separation of starch & gluten.**

at Indianapolis, Ind., has converted from tables to centrifugals, and at least four other manufacturers—Corn Products Refining Co., A. E. Staley Mfg. Co., Penick and Ford, Inc., and Union Starch and Refining Co.—have indicated that they plan to install the machines for primary work.

In the five years that Hubinger has been operating its primary separation installation, it has accumulated a considerable store of information and experience on this use of centrifugals. It is through the assistance and cooperation of the Hubinger management and engineers that CHEMICAL INDUSTRIES is privileged to bring to its readers this first report on such an installation that has appeared in the technical press.

As is frequently the case with pioneering, circumstances were an important factor in causing Hubinger to decide to try centrifugals for primary separation. In 1941 the company was faced with the problem of increasing its output of corn starch without expanding its plant area. Also, part of its existing starch tables were in such bad condition that either extensive repairs or complete replacement would soon be necessary. So from an investment standpoint, the organization was in a position of virtually having to rebuild the starch recovery portion of its plant. If centrifugals could really do what the manufacturers claimed, here was a perfect chance for them to prove it. Also, a new large model centrifugal had just become available.

An experimental Merco machine was installed in 1942 and eventually was so successful that today Hubinger has completely abandoned its starch tables and is handling the starch separation from a corn grind of 20,000 bu. per day with three 16-in. (rotor dia.) and three 30-in. Mercos. A fourth 30-in. Merco is being used as a thickener for concentrating recycle material.

### CENTRIFUGALS vs. TABLES

Dr. R. L. Albrook, Hubinger's vice president in charge of production, draws the following comparisons between centrifugals and tables based on experience gained from the installation at Keokuk:

1. *Space:* Centrifugals require much less space for a given throughput. The total floor space required for tables to handle a corn grind of 20,000 bu. per day is about 69,000 sq. ft., as against 7,500 sq. ft. required for the present installation of six centrifugals. If the three 16-in. Mercos were replaced by one of the newer 30-in. machines (the ratio of the capacities of the two models is about 3 to 1) the space required for the centrifugals would be only about 5,000 sq. ft.

2. *Cleanliness of operation:* Since the centrifugal system is completely enclosed, contamination of product is more easily avoided than in the case of the open tables. It is also easier and cheaper to keep the operating area clean.

3. *Start-up and shut-down time:* For centrifugals, the start-up time is about 45 minutes, and the entire system can be balanced within two hours. For tables, this takes from 8 to 12 hours. When shutting down the tables, it is necessary to flush off all the starch in order to avoid souring, which again takes 8 to 12 hours. The centrifugals can be flushed in less than an hour.

4. *Separation efficiency:* The centrifugals give a better separation of starch and gluten, resulting in a greater yield of

# and Gluten

starch. The best table operation gives a gluten containing about 36% starch, while centrifugal separation leaves only 15 to 22% starch in the gluten. This represents an increase in starch recovery from 85-90% of theoretical on tables to 95% or better by centrifugals. The centrifugals also yield a gluten higher in protein (64% or higher as against 50% for the tables) which is more easily processed chemically or more readily marketable as stock feed.

5. *Water requirements:* Because of the efficient washing of the starch accomplished in the centrifugals, less is required subsequently on the filters, with the result that the overall water requirement is less than when tables are used.

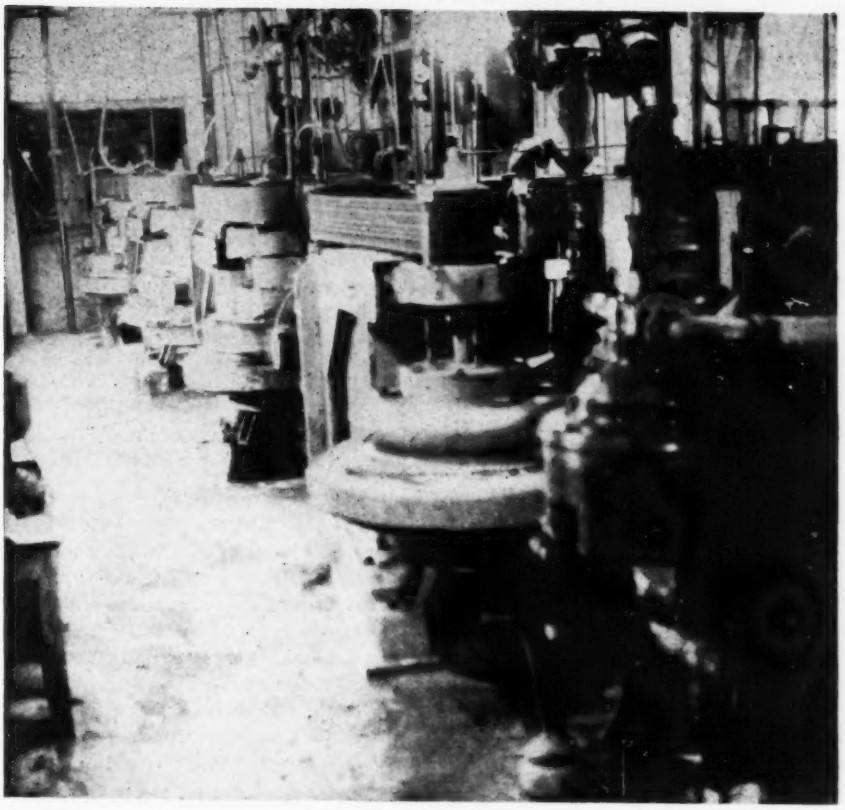
6. *Separation efficiency on heated corn and corn that has been dried artificially at high temperatures:* When corn is stored without proper drying, it tends to heat up, and a change in chemical constituency takes place which makes separation of the starch and gluten more difficult. Artificial drying at high temperatures has the same effect. Both of these types of corn are encountered more frequently today as a result of the high demand for the grain and the desire of farmers to rush their crops to market with the least possible delay. Centrifugation gives a better separation of starch-gluten from these corns.

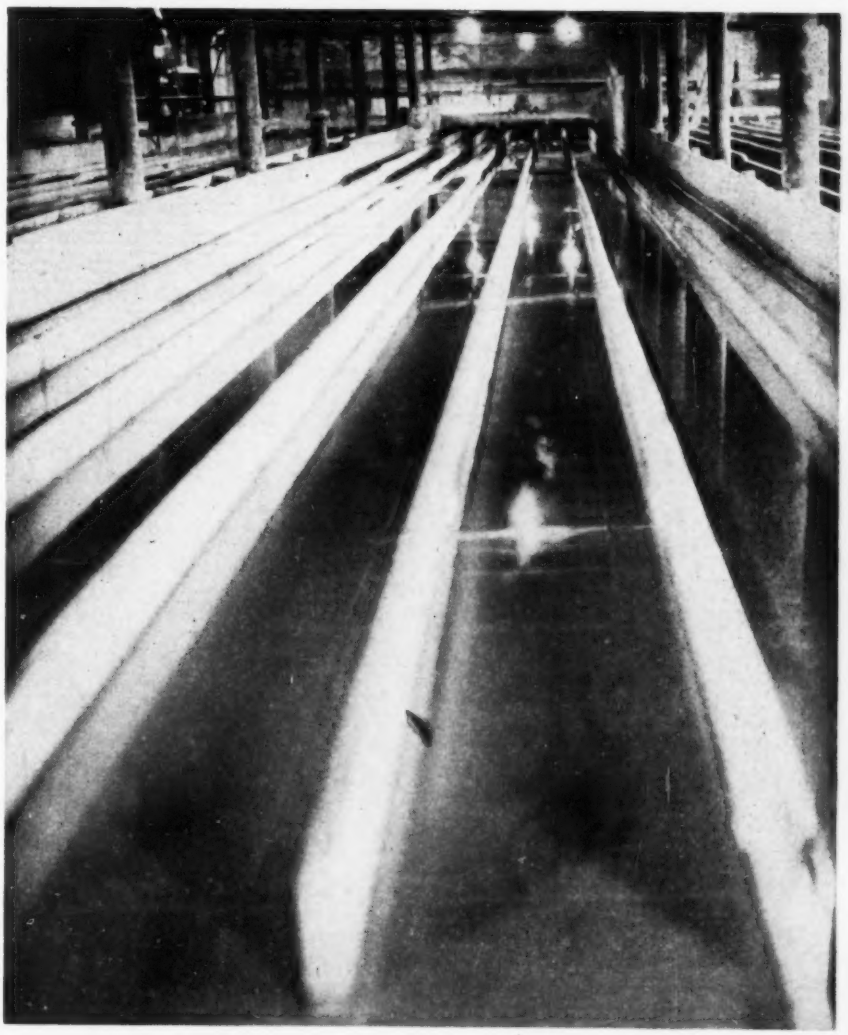
Heated corns contain proteins less easily attacked in the steeping process, which tend to show up as insolubles to the extent of 0.7 to 1% in the final starch in table separation. With its centrifugals, Hubinger has been obtaining only about 0.4% insoluble proteins in the starch from heated and artificially-dried corn. This compares with 0.26 to 0.38% in the case of properly air-dried corn.

7. *Capital Investment:* This is roughly the same for both. At 1947 prices, an installation of either tables or centrifugals to handle 20,000 bu. of corn per day would cost about $250,000.

8. *Labor Requirement:* Hubinger employs one operator per shift to handle all six of its centrifugals operating on separation. An equivalent table installation would require four men per shift. Training of a good centrifugal operator, however, takes 24 to 36 months.

9. *Power Requirement:* Each of the 30-in. centrifugals is now using a 100-hp motor, making a total power requirement of 400 hp for a 20,000-bu.-per-day corn grind. The requirement for an equivalent table installation would be about 300 hp.





**An indication of the relative amounts of space occupied by gravity tables and centrifugals for starch separation is obtained by comparing the photographs above and below. Above is the installation of centrifugals at Hubinger's Keokuk plant; below are the starch tables.**

Hubinger engineers believe, however, that 80 hp motors could handle the centrifugal load satisfactorily, which would bring the total power requirement for the centrifugals down very close to that of the tables.

This is a rather impressive array of evidence in favor of centrifugals. Now let us look at the separation operation itself as it is carried out by these machines. But first, a quick glance at the steps involved in processing corn prior to the separation of the starch and gluten:

## PROCESSING STEPS

The whole corn is first steeped in dilute sulfurous acid, which breaks down the gluten. At the same time lactic acid fermentation takes place, which softens the kernel. The solubles (protein, sugar, and other carbohydrates) are also removed at the steeps, concentrated, and used for stock feed, yeast culture medium, or penicillin culture medium.

The steeped corn is cracked to loosen the germ, which is floated off in a germ sparator for food use. The material remaining in the germ separator, which includes the fiber, gluten and starch, is ground in buhr mills and the fiber screened out on nylon-covered reels and shakers. It is the underflow from the reels and shakers that contains the starch and gluten. This is concentrated to 12 Baumé gravity by filtering and reslurrying and comprises the feed to the Merco centrifugals.

The Merco is a centrifugal that is especially designed to separate continuously two solids of different settling characteristics in liquid. It is, in effect, a hydraulic classifier in which the force of gravity has been supplanted by centrifugal force. For the present at least, it is the only centrifugal being used commercially for the primary separation of corn starch and gluten. Based on several years of experimentation, the Hubinger engineers have found that this separation is best accomplished in two stages. The reason becomes evident upon consideration of the principle of operation of the Merco machine.

## OPERATION OF CENTRIFUGAL

To see this clearly, let us refer to Fig. 1 and follow the path of the fluids through the machine, using the letters as guides. First, note that a dashed line has been drawn around the rotor, which is the only moving part of the centrifugal. The starch-gluten slurry feed (the concentrated underflow from the reels and shakers) enters at inlet A and passes down the rotor feed inlet to where it contacts the feed impeller blades C and is brought to the speed of the rotor. It then passes outward through the narrow peripheral aperture D and enters the separating chamber E, which it completely fills. There, the centrifugal force causes the starch, which is heavier than the gluten, to move toward the discharge zone R. Since the underflow outlet nozzles N are large enough to accommodate only part of the flow coming into the machine, by way of the feed and return, the lighter constituent (gluten) is swept along with the overflow liquid out of the separating chamber E, up through a nest of conical discs G, over the circular weir H, and into the overflow volute I.

The underflow (starch) which goes out through the nozzles flows to a vent box, from which part is drawn off and the rest returned to the machine. The return portion is accompanied by fresh wash water and travels up through the return inlet O, over impellers S and T, and into the discharge zone R. The centrifugal acts as its own pump. If the quantity of wash water used is greater than the amount of water in the underflow, what is known as an "upflow" is created in the separating chamber E. If it is less, a "downflow" takes place in the separating chamber. This is one of the critical controls in the operation of the machine.

Since there is no sharp demarcation between the starch and the gluten in the separating chamber, it is apparent that a clean separation cannot be obtained in a single machine. It is likewise apparent, however, that by varying the feed, wash water, and starch draw-off rates, the machine can be operated to give either a starch relatively free of gluten, or a gluten relatively free of starch.

It is this versatility that is made use of in the two-stage operation, which is shown schematically in Fig. 2. The controls on the first-stage machine are set to produce good gluten and what would be termed a

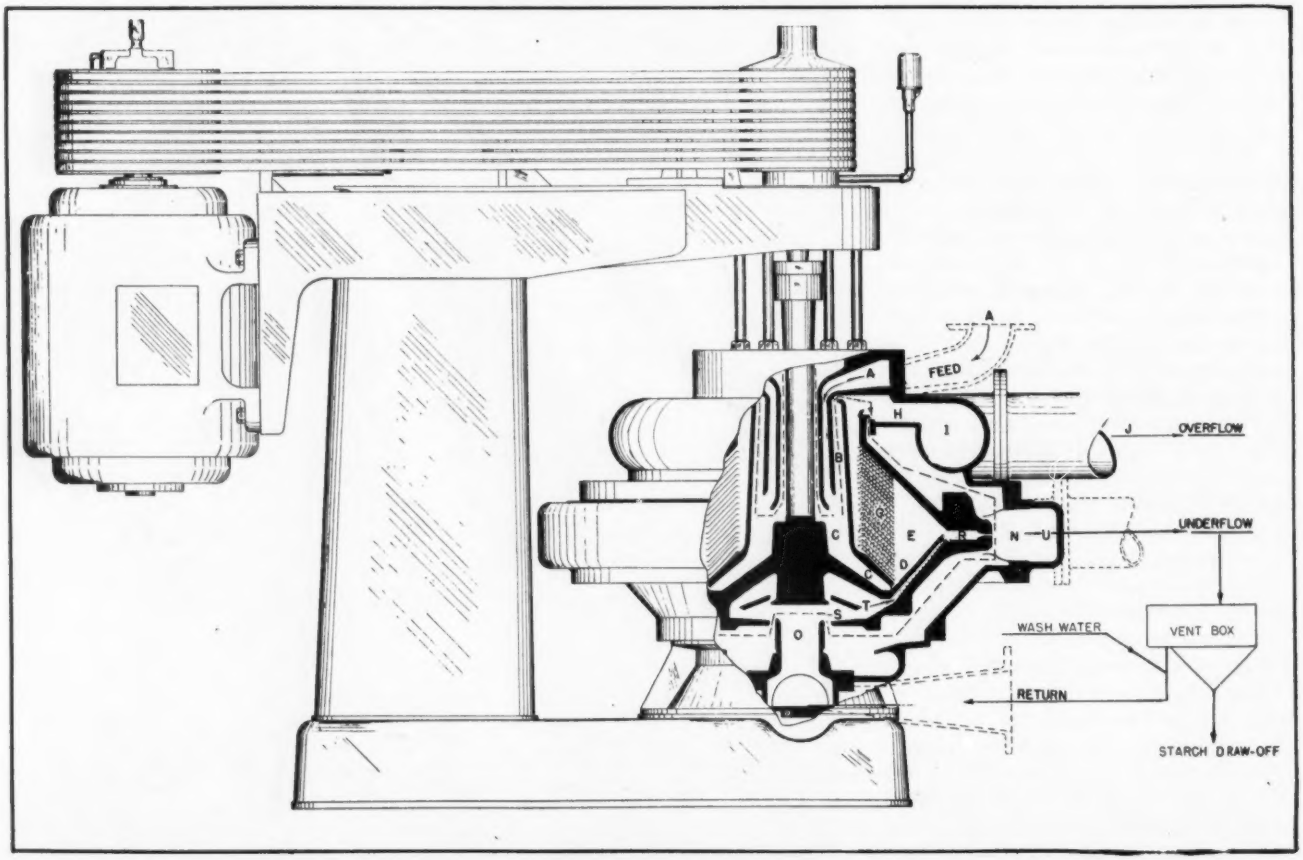



Fig. 1—Cut-away drawing of the 30-in. Merco centrifugal. The dashed line encloses the moving element, or rotor.

poor starch. The starch from the first stage is then fed to the second stage, which is set to produce a good starch and poor gluten. This poor gluten is concentrated back to 12 Bé in a third Merco and added to the feed going to the first. Thus the only two products drawn off from the system are a good starch and a good gluten, and an effective separation is accomplished.

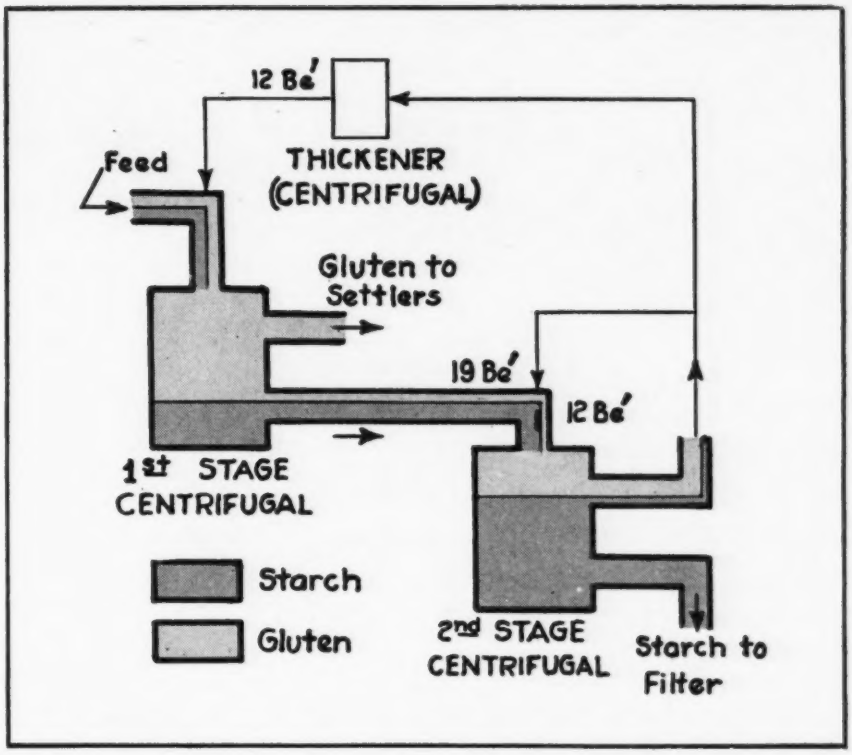



**Fig. 2—Schematic diagram of the two-stage centrifugal system for separating starch and gluten. The first stage gives a good gluten and poor starch, while the second stage gives a poor gluten and good starch, as indicated by the composition of the draw-offs from each.**

## OPERATING VARIABLES

Three principal factors affect the efficiency of the separation as carried out in the centrifugals. One of these is the density of the starch zone at the periphery of the bowl. If the density is low, gluten will go out with the starch. If the density is high, starch will go out with the gluten. This variable is controlled by the rate of draw-off of starch from the vent box.

The second critical variable is the retention time of the feed in the rotor of the machine. For any given quality of feed, the greater the amount put through the centrifugal, the less retention time in the rotor and consequently the less time the centrifugal force has to act and the sooner the separation. This variable is controlled by controlling the volume and density of the feed.

The third variable is the wash water, the function of which is to displace the carrying fluid in the starch underflow and wash the starch. In the first-stage machine, the amount of wash water is set to give a slight downflow in the separating chamber, which brings the starch away from the gluten. In the second-stage machine, a slight upflow is maintained to wash the gluten out of the starch.

Both the wash water and feed rates are controlled by rotameters. Once the operating conditions have been set, it is important that a constant feed rate and density be maintained to get good separation.

## FLOW RATES

For a 30-in. first-stage Merco handling 10,000 bu. of corn per 24 hours, Hubinger feeds 1,120 lb. of 12 Bé starch-gluten slurry per min. plus 400 lb. water for washing. This produces a downflow of 13 lb. per min. and yields 630 lb. per min. of 19 Bé starch-gluten underflow and 890 lb. per min. of gluten overflow. The gluten thus obtained averages about 64% protein on a dry basis, compared with 50% for the gluten obtained from tables. Starch content of the gluten is about 22%, compared with 36% for that from tables. The Mercos can be operated to give a much lower starch content in gluten, but the lowest practical limit is about 15%.

In the second stage, the starch from the first-stage machine is diluted with second-stage overflow from 19 to 12 Bé and is fed to the second-stage Merco at a rate of 1,000 lb. per min. plus 900 lb. per min. of wash water. The second-stage machine produces 1,260 lb. per min. of 19 Bé starch underflow and 640 lb. of gluten-starch overflow. The starch underflow goes to a filter where the starch is washed to remove traces of solubles. The water from this filter is returned to the second stage centrifugal where it is used as wash water.

The second-stage gluten-starch overflow is concentrated to 12 Bé in another 30-in. Merco and put back into the feed of the first-stage machine. The water thus separated is used as wash water for the first-stage machine. It can also be used as wash water in the mill house if the insolubles are held to 100 gr. per gal.

This process of centrifugal separation gives a starch that contains 0.26 to 0.38% insoluble protein, which is about the same as obtained in the better grade products from the tables.

The solubles, however, will run 80 to 100 grains per gallon of slurry at 5 Bé, while a starch from tables will run 300 to 400 grains of solubles on a comparable basis. Thus considerably less washing is required on the filter when centrifugal separation is used.

## MAINTENANCE

The Merco centrifugals are entirely enclosed, and all parts in contact with the slurries are made of stainless steel. All piping is either stainless steel, bronze, or plastic. The total amount of pipe needed is small compared with that required for table hook-ups.

At 1800 rpm the machines develop a force at the periphery of about 1800 times gravity. Hubinger first started operating its machines at this speed, but found the separation difficult to control. After stepping them up to 2250 rpm, control was achieved much more easily. Some of the machines were run as high as 2550 rpm for a time, but this speed gave no better separation nor increased capacity.

The principal points of maintenance on the Mercos in starch separation service have been found to be the discharge nozzles, of which there are 20 around the periphery of the rotor, and the rotor shaft bearing. The nozzles are bushed with tungsten carbide to resist abrasion and contain an orifice of approximately 1/10 in. dia. when new. By changing the worn nozzles from the first-stage machine to the second, where the nozzle diameter is not as critical, a single set of nozzles can be made to last 8 to 12 months.

The rotor shaft bearings were a source of some trouble in the Hubinger installation at first, but a new bearing design has been in use for some time and has given no difficulty. Maximum downtime of the Hubinger machines in any one month has been 16 hours, giving an operating factor of about 98%. Operators are carefully trained in the maintenance of the centrifugals as well as in their operation.

In the replacement of starch tables by centrifugals, corn starch makers have made a major advance in the technology of one of the country's oldest chemical process industries. And the machines are not limited to corn and wheat alone. They have operated successfully on potato starch, and Corn Products Refining Co. is planning to use centrifugals in its new starch plant at Corpus Christi, Texas, which will operate on milo maize.

# ANTISKID RUG BACKINGS

## Newer Formulations Spark Specialty Makers' Interest

by DOROTHY A. NEIDIG
Burrell and Neidig, Inc.
New York, N. Y.

**LATEX-BASED PREPARATIONS FOR BACKING RUGS were just achieving popularity in both industrial and household markets when the rubber shortage ruled out their manufacture. Now, however, many specialty houses are re-entering the field, expect to profit from these simply-made compounds.**

FOR many years homemakers have sought some way to anchor illusive scatter rugs to the floor without actually resorting to hammer and nails. Now, however, the relatively recent development of rubber latex emulsions has come to the rescue of those homemakers harassed by skidding rugs. Such emulsions when applied to rug backings make them virtually skidproof. Further, this new development may actually decrease the incidence of accidents in the home due to slipping rugs.

Just prior to the war one company placed a natural rubber latex on the market which could be applied inexpensively at home to rug backings. Promoted by an energetic advertising campaign, this product immediately took hold and was enthusiastically received by the buying public. It was, of course, necessary to withdraw this latex from the market during the war when rubber became scarce. Significantly, however, during the past year a few progressive specialty manufacturers have again begun to market these antiskid backings. Their products have been so well received that many other specialty houses are now entering the field.

### LOW INVESTMENT

Actually, this development is a "natural" for many specialty houses because the latex emulsions are supplied in bulk by rubber companies. Thus, the specialty concern need only set up adequate packaging equipment since it is assumed that most have already developed the marketing of similar products.

The primary function of these latices is, of course, to furnish a backing for rugs which will anchor them to the floor without harming either the rug or the floor in any way. However, the backing also serves the additional purposes of helping to prevent fraying and to keep the pile of the rug from pulling out. These backings give additional weight and body to the rug yet still allow the rug to remain flexible.

### WHAT THEY MUST DO

Such rug backings must meet a number of very definite requirements. Thus, for example, it is imperative that the antiskid compound not mar the floor. It must not become tacky and stick to surfaces on exposure to direct heat or sunlight over a prolonged period of time. Further, the film must remain effective for at least six months to a year. It should not be tacky or it will pick up lint and dirt over the surface and thus lose its "grip." A second coat of the latex emulsion may be applied over the first when the first becomes dirt clogged. The length of time that a coating will last depends, of course, on the location of the rug. For example, a rug at the foot of a stair will pick up more dirt than one in an upstairs hall. These films may be removed, if desired, by dry cleaning. Another requisite is that the film not yellow on aging or exposure to the air.

*United States Rubber Co.*

**Latex-based preparations for backing rugs can also be used for joining the square-cut edges of the padding used under the carpet.**

Packaging of emulsions for retail consumption usually presents problems. The emulsions must be formulated so that they are not affected by exposure to sunlight or temperature extremes during storage in warehouses or on the retailer's shelves or display windows.

### HOW TO PACKAGE

Another requisite of the latex backings is that the viscosity be such that it may be applied easily by brush, spray gun, or stick and still be fluid enough to lend itself to optimum mechanical filling operations. For example, a latex emulsion which paints on a rug back easily may be so viscous that it slows down automatic filling equipment to less than fifty per cent efficiency. Several methods have been used with these viscous latex emulsions to obtain optimum efficiency of the filling equipment. Agitation and slight heating during the filling operation have been shown to be the most effective methods of speeding up either mechanical or hand filling and do not appear to affect the stability of the product; however, if it is desired to alter the viscosity of the emulsion permanently, the balance of the emulsion must be changed by varying the quantity and/or type of emulsifying agent used or by the addition of ammonia.

The problem of adjusting the viscosity and still maintaining the other necessary qualities is indeed complex and changes should be made by the supplier of the latex. The viscosity of the latex emulsion influences to some extent the covering capacity of the compound. As a consequence, many of the companies marketing these products keep close controls on the viscosity of their material. Viscosity measurement by Ford cup is sufficiently accurate for this purpose.

The odor of the compound must not be disagreeable. One of the backing compounds previously on the market had such a strong ammoniacal odor that it made it most unpleasant for use in the home.

Another important requirement of a good rug backing is quick drying time and, in no case, should a film take longer

than overnight to dry. Most of these latices dry tack free overnight even in very humid weather.

Laboratory examinations have been conducted to ascertain the effectiveness of various rug backings. Swatches of rug treated with these latex backings have been subjected to severe Fadeometer, oxygen bomb, and oven tests. Many of these films hold up well. In addition, evaluation under actual use conditions has shown that the rubber film backing work so well that it is now being used for anchoring small rugs in heavy traffic areas.

Prevulcanized latices are to be preferred since they are less sensitive to temperature changes, show better aging characteristics, and possess elasticity over a greater temperature range. Optimum results have been obtained with prevulcanized latex emulsions of 30-50 per cent colloidal dispersion of rubber in water.

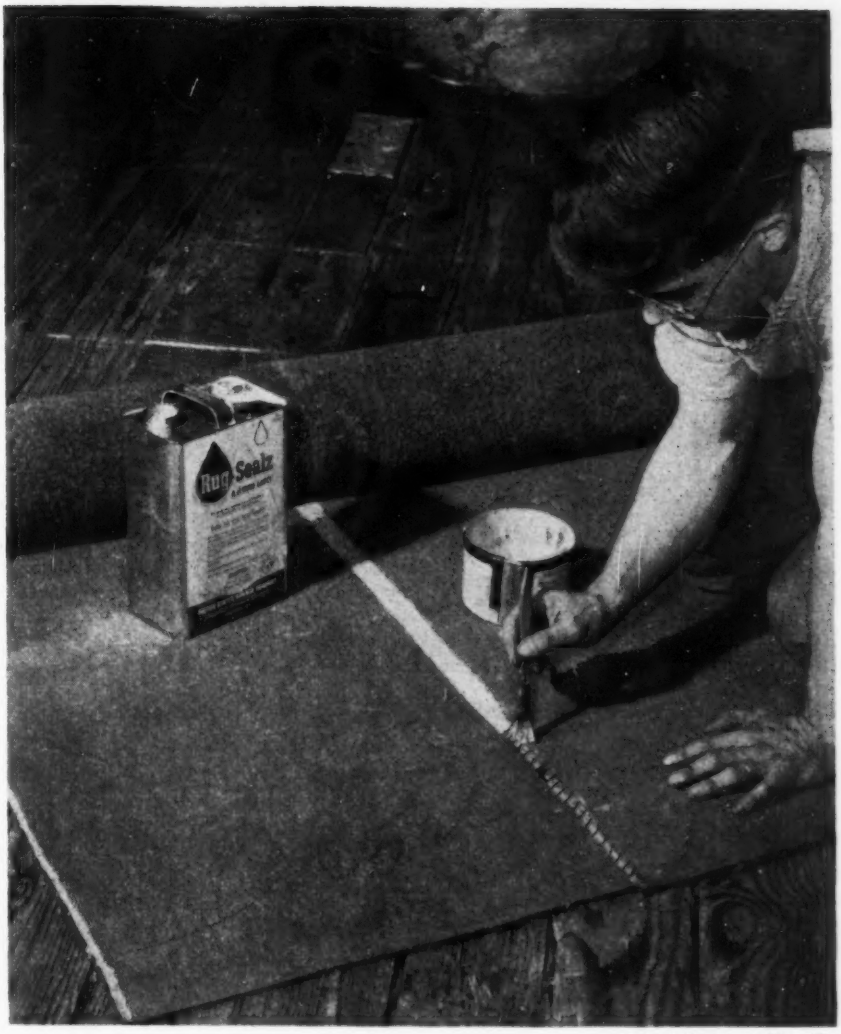
The anti-skid rubber backings are used with great success on almost all types of rugs; hooked, axminsters, cotton, broadloom, and tufted rugs. The rugs with more porous backings absorb more latex and thus take longer to dry.

No preference seems to exist as to packaging in glass or metal containers. The latex emulsions are packaged in pint, quart, half gallon and gallon containers for retail consumption and in 55 gallon drums for commercial applications. Loss by evaporation, always a problem when packaging liquids, is avoided with these compounds since they form a rubber seal at the neck of the container. Adequate precautions must always be taken against freezing during storage.

### THE OUTLOOK

The covering capacity of these latices is important if they are to compete economically with the rubber pads now on the market for the same purpose. It must be remembered that several applications of latex are necessary during the length of service of a rubber pad. Usually a pint of the emulsion is more than adequate to cover a 9 x 12 ft. rug stripwise.

While as yet no figures are available as to the amount of latex used for anti-skid backings, the ever increasing number of manufacturers placing latex type backing compounds on the market indicates substantial interest in the specialty and suggests that manufacturers at least feel that a real need exists for this type of compound. It is still too early to predict the future market for the rug backings either in the home or on a commercial scale; however, most of these compounds have been carefully formulated and attractively packaged. An energetic advertising campaign to acquaint the public with their merits has been lacking and, since considerable customer education is always necessary to introduce a new product of this type, would be of great help in developing both the industrial and household markets.




*United States Rubber Co.*

**Latex emulsions are usually applied in regular strips to the back of the carpeting and can be applied to the seams for reinforcement as well. The compound used will cure in about an hour.**

# New Sunburn Ointments Developed

The formulas for two wartime-developed sunburn ointments which coat the skin with a light non-greasy, non-sticky film resistant to water, perspiration and abrasion are contained in two reports (PB-40465, 40466) for sale by the Office of Technical Services, Department of Commerce.

The search for a better sunburn preventive was essentially a search for an efficient sunscreen base, the first report states. The requirements called for the use of readily obtainable non-toxic, non-irritating ingredients, easy to apply and remove, and with rapid drying power and resistance to mechanical rubbing, water and perspiration. Of the many preparations compounded, two stearate base ointments, one a vanishing cream, rated highest in protection and comfort. By comparison with two commercial ointments, they were found superior in resistance to water and perspiration.

Although the formulas for the two ointments vary considerably, both contain homomenthyl salicylate and p-amino benzoate, the most efficient sunscreen bases tested, magnesium oxide for reflecting light, magnesium stearate and butyl stearate to give a dry adhesive film with good water repellancy, and a pigment base to match the skin. The straight stearate base ointment gave as good results as the stearate ointment containing 30 per cent vanishing cream, the second report states.

The second report also contains the formulas for a number of ointments compounded during the research program, the results of tests and a recommendation that field tests should be conducted before acceptance. It emphasizes the possibility that ethyl p-aminobenzoate might be absorbed through long contact with the skin, counteracting a subsequent treatment with sulfa drugs. However, if tests should show that p-aminobenzoate is stored in the skin, the chemical could be omitted without seriously imperiling the effectiveness of the ointments.

Guar plants in an experimental plot on the Soils and Crops Farm, Purdue University.

# GUAR—A New Industrial Crop

by ROY L. WHISTLER, Department of Agricultural Chemistry
Purdue University Agricultural Experiment Station
Lafayette, Indiana

**THE PAST FOUR OR FIVE YEARS have seen the first commercial production and use of guar, a carbohydrate crop new to the United States but destined for continued production and expansion with the possibility of becoming a high-ranking industrial commodity.**

AMONG the exigencies of the war years was a strident industrial demand for gums which could serve as thickeners, solution stabilizers, and particularly as sizing agents for paper and textiles. Prior to this time the gum most used for these purposes was locust bean gum, which is the ground endosperm of locust beans grown in the Mediterranean area. Importation of this gum was, of course, greatly reduced during the European conflict. Surveys* of potential domestic gum sources revealed only one which would not be handicapped by production or collection difficulties. This source was guar, a soybean-like legume, the seed of which was available at several places in the United States but not then grown for commercial use. Guar met so well the requirements of a domestic gum producing plant that its agriculture and milling were at once undertaken. Uses for the flour developed rapidly, so that each year it has become necessary to extend the acreage devoted to guar production.

## ORIGIN OF GUAR

Guar, known botanically as *Cyamopsis tetragonoloba*, is native to India where it is grown widely as a cattle feed and is sometimes used as food by the lower classes. It was introduced into this country in 1903 by the U. S. Department of Agriculture and tested as a feed and cover crop for the southwest. However, it evidenced no particular advantages in these respects and remained more or less a curiosity until a need arose for its gum-containing seeds.

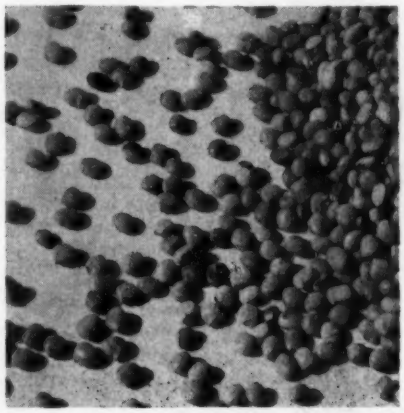
## CHARACTERISTICS OF THE GUAR PLANT

The guar plant is a legume. Most common varieties are vertical stalked plants three to six feet high, bearing large leaves and clusters of bean-like pods, each of which contains six to nine pea-shaped seeds. It is extremely drouth-resistant, being able to use efficiently all ground water. However, it also grows luxuriantly in regions of average rainfall. It is definitely a soil-improving crop. A heavy tap root loosens the upper strata of soil and, by penetrating into the lower strata, facilitates drainage of ground water for the succeeding crop. Among other prominent advantages of the guar plant is its high resistance to insects and disease.

## AGRICULTURAL PRODUCTION

As a consequence of the demand for a gum such as may be obtained from guar, General Mills undertook large scale agricultural production of the plant. Since existing varieties of guar require warm weather and a relatively long growing season of 135 to 165 days, the southwest was selected for its production. It is grown in the highly productive valleys of central and southern Arizona and Southern California. Farmers grow crops by contract arrangement with the company and under close supervision of skilled agronomists. Planting is done with common grain drills in warm moist seed beds. Harvesting is accomplished with standard grain combines after proper adjustment of reel height and speed. Good stands produce 1,200 to 1,500 pounds of seed per acre. These relatively large returns are necessary for the successful growing of guar because of the high land value of the fertile areas on which the plants are grown. Still larger yields are to be expected as the plants are bred for greater productivity and as more efficient harvesting methods are developed.

Although guar is now grown only in the fertile southwest valleys, it is possible that its production may be extended to the great plains area where the large-scale production of an industrial crop would be of immense economic value to the region. Furthermore, interest in the crop has become sufficiently strong that workers at Purdue University are now



Guar seeds.

* Most of the preliminary surveys were made by the Institute of Paper Chemistry, Appleton, Wisconsin.

attempting to shorten the growing season of guar in the expectation that it might become an important crop in the corn belt. Conversion of some corn or wheat acreage to the growing of a new purely industrial crop would tend, in some measure, to prevent the undesirable accumulation of great corn and wheat surpluses that so often occur.

### PRODUCTION AND PROPERTIES OF GUAR FLOUR

Seeds of the guar plant are exceedingly hard and tough when dry. This property appears to be common to most seeds containing significant amounts of the polysaccharide, galactomannan. To remove the seed coat the seeds are passed rapidly through a flame which very slightly scorches or sears the seed-coat and permits it to be easily removed by a scouring or a pearling operation. After removal of the germ by mechanical separation, the endosperm is ground to a fine, light, gray flour.

Guar flour is dispersible in either cold or hot water. It is most easily dispersed by slowly adding the dry powder to vigorously stirred hot water. High viscosity collodial dispersions are obtained at very low guar concentrations. Good grades of guar flour have five to eight times the thickening power of starch. Pure water sols do not set to a gel on standing but may be readily converted to a gel by the addition of small amounts of borax. In most of its properties guar flour resembles locust bean flour or the endosperm flours of such other seeds as Tara, Coffee bean, Cassia, Algarroba, Flame Tree, Cortalaria, Huizache, etc.

### PRESENT INDUSTRIAL USES OF GUAR FLOUR

One of the largest uses of guar fluor at present is in the sizing of paper. It is also a valuable aid in the hydration of paper pulp. These are applications for which locust bean flour has been used with marked success. Small additions of either of these flours to paper beaters decreases considerably the time required to hydrate the cellulose fibers to the point where they can form satisfactory paper sheets. The presence of gum also causes the sheets to be smoother, have a greater fold resistance, and possess greater wet strength. Mixed with starch, guar flour is useful in the sizing of textiles. By itself it has proven useful as a solution or dispersion stabilizer and as a thickening agent for salad dressings, ice cream mixes, bakery products, and other foods. It is also of considerable value as a thickening agent in printing pastes and finishes.

### POSSIBLE NEW INDUSTRIAL USES OF GUAR

Two new uses appear likely for guar. One of these is the use of the triester, as for example the acetate or butyrate, for the preparation of plastics or films. Both derivatives have been prepared and cast into clear, transparent films of high strength and considerable pliability. A second application may be in the preparation of industrial adhesives through modification of the polysaccharide by heat or oxidation.

### COMPOSITION OF GUAR FLOUR

Analysis* of guar flour indicates that it is a relatively pure carbohydrate. It contains approximately 7.1% of non-carbohydrate material of which the major impurity is protein (4.1%) or other nitrogen-containing substances. Fatty material and other alcohol soluble substances represent only 1.5% of the flour.

Not all of the flour is soluble in water. Centrifugation of an aqueous dispersion readily separates the water-soluble from the water-in-soluble components. A dispersion which has been autoclaved for 3 hours has 87% of the flour in soluble form. Longer periods of autoclaving do not appreciably increase the amount of soluble component. This component is almost pure carbohydrate. It contains less than 0.1% nitrogen and is practically free of phosphorus and fatty material. Unlike most gum-forming polysaccharides, the soluble component contains no uronic acid groups. Fractionation of its solutions by gradual addition of ethanol shows that it is of quite homogeneous composition. Except for the first 2-4%, the material precipitated from the soluble phase of ethanol is of uniform composition and properties. This material represents 92% of the soluble component and is considered to be a pure polysaccharide. It contains approximately 35% galactose and 63% mannose. Since it contains more mannose than galactose, it is most properly designated a galactomannan and has been given the specific name guaran.

### STRUCTURE OF GUARAN

Very little work has yet been done in elucidating the architecture of guaran or, for that matter, of any of the galactomannans. Preliminary work suggests that guaran either is a linear chain of galactose and mannose units in random arrangement or consists of a principal chain with randomly attached side chains consisting of perhaps only one sugar unit each. These speculations arise from the observation that guaran triacetate produces rather pliable films which may be elongated 550% by stretching in hot water, and that after elongation the films become anisotropic to polarized light but remain amorphous when examined by X-rays. It is also likely that the alpha-galactose linkage predominates in the guaran structure because of hydrolysis with acid the optical rotation of guaran changes from a positive to a less positive value and on treatment with diastase a large drop in viscosity has been observed.

Guar plants showing flowers and seed pods.

* All analytical and chemical data presented are taken from the work of Eileen Heyne and Roy L. Whistler—paper presented before the 111th meeting of the American Chemical Society, Atlantic City, 1947. Manuscript now in press.

# Triple Toxicant Dust for Cotton

A novel insecticidal composition, designed to control practically all the important insects that attack cotton crops, has been formulated by the Du Pont Co. Tradenamed Cotton Dust No. 10, the new specialty was used this year by commercial growers.

The compound contains DDT, benzene hexachloride and sulfur, each of which kills some but not all of the cotton-attacking pests. BHC is primarily effective against the boll weevil, fleahopper, leafworm, and aphids; DDT curbs bollworm infestations. Sulfur is included in the mixture because it has some value in combating mites and fleahoppers.

The dust is applied on the basis of 10 to 15 pounds per acre. The exact range of usefulness of this mixture on crops other than cotton has not been ascertained.

# RUST PREVENTIVES

## How They Work, What They Contain

by HELEN SELLEI*
Nox-Rust Chemical Corp., Chicago, Illinois

**A LITTLE-DISCUSSED INDUSTRY, DEVOTED to the manufacture of rust preventive coatings, has chalked up real progress in the past few years. Now, able to draw on a vast reservoir of war-gained experience, it is busy developing new compounds, evaluating many ordinary and unique chemicals.**

NOT COMMONLY recognized is the fact that the protective coatings industry is composed of two major divisions. One, and by far the more frequently discussed, produces paints, varnishes, etc. —that is, materials which yield decorative and durable coatings. The other, and the division which has grown lustily in the past few years, is concerned with the manufacture of coatings which act as temporary, readily-removable preservatives for metal surfaces.

A few decades ago the field of temporary protective coatings could be simply defined. It was limited, and furthermore, most rust prevention consisted merely of coating a metal part with mineral oil or pitch. But that is far from the case today. Currently, and largely as a result of war-engendered necessity, a wide range of rust preventives has been developed. The fundamentals of corrosion prevention have also been more completely evaluated, the use of multifarious chemicals more fully appraised.

* New address: Standard Oil Co. of Indiana, Whiting, Ind.

### HOW CORROSION OCCURS

It is well known, of course, that unprotected ferrous (and some non-ferrous) metals deteriorate on exposure to the atmosphere, and, furthermore, that such corrosion phenomena are the result of electrochemical reactions. Oddly enough, this electrochemical nature of metal corrosion was recognized by Sir Humphrey Davy[2, 3, 4, 5] even before Faraday[6] promulgated the laws of electrolysis.

Today the electrochemical process as the initiator of metal corrosion is well established.[7, 8] According to this concept iron, when exposed to humidity and oxygen, develops points of different potential. Some of the iron goes into solution, thereby changing to ionic form, and simultaneously hydrogen is liberated. A potential difference develops between the point where the metal goes into solution and the point of hydrogen displacement, resulting in local electric currents. These currents mount, promote an ever-increasing rate of metal deterioration. Naturally, if the development of such currents can be prevented, the metal will not corrode.

One of the most popular methods employed to eliminate corrosion is the application of an impervious, tightly-adherent coating to the metal surface. The objective is, obviously, to exclude atmospheric oxygen and moisture. Such a coating may be of either a temporary or permanent character, but it is with the former type of product with which this article is concerned. That is, coatings used to protect fabricated metal parts in storage or in transit.

### MAIN TYPES OF COATINGS

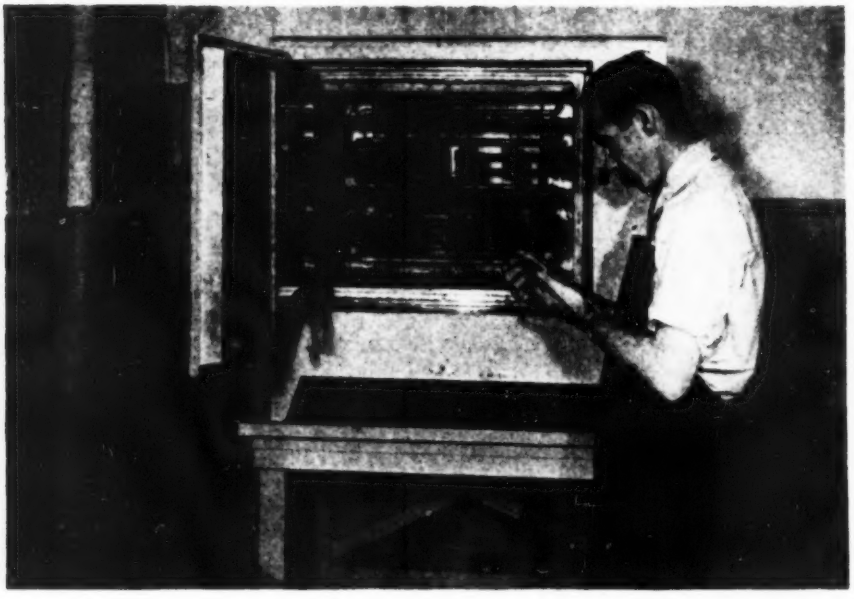
The simplest way to achieve protection from corrosion is to isolate the metal from the corrosion source—as in a package. This can be done by wrapping paper tightly around metal parts, or by using some other pliable product which will take the shape of the article to be preserved, or adhere to it entirely.

These were the only means considered for temporary protection about thirty years ago, and petroleum derivatives, such as petrolatum and mineral oil, were widely used.[9] A straight, uninhibited mineral oil generally proved to be unsatisfactory, but the mechanical protection provided by a thick layer of petrolatum cannot be disputed. It might be mentioned, parenthetically, that texts issued as recently as 1933 still cited straight mineral oil as a protectant.[10] Pitch and uncompounded asphalt were also employed as protective agents, but the poor adhesion of these materials to the metal surface resulted in rapid corrosion taking place underneath the seemingly tough coating.

Natural resins and synthetic resins have also been tried as protectants. Plasticized natural rosin and hydrogenated rosin give a rather appealing coating but provide only minimum protection. The difficulty of removing these coats, coupled with the doubtful benefits obtained, led to their abandonment. Most synthetic resins do not give any additional protection to the metal except for the rather thin mechanical barrier provided by the film.

### NEW SPECIFICATIONS, IMPROVED PRODUCTS

In the early days of the past war both the Army and Navy realized the urgent need for coatings which would protect equipment which had to be shipped thousands of miles before being put into service. The high humidity encountered in ocean shipping, the extreme climatic conditions of Arctic and Equatorial zones, all had to be considered. And, as a result, specifications and standard tests were drafted so that the worth of any coating for any specific use could be determined.



**The Weatherometer determines effect on protective coatings of ultraviolet light, heat, and moisture. Thirty 24-hour cycles are equivalent in effect to a full year of outdoor exposure.**

There is no doubt that military enterprise did much to advance the industry from its art status to that of a science.

These specifications covered a broad group of products—compounds designed to protect large parts during outside storage, stored internal combustion engines, small arms, bearings, etc. It is not within the scope of this paper, however, to discuss all the existing government specifications, but in view of the fact that they represent the main standards which industry has, they are tabulated in Table 1.

**TABLE I**

**Temporary Rust Preventive Coatings**
**(Examples from Government Specifications)**

| *Object of Protection* | *Specification* | *Number and Date of First Issue* | *Designation of Material* | *Nature of Material and Coating* |
|---|---|---|---|---|
| I. Outdoor protection of ferrous and non-ferrous metal | U. S. Army | 2-82 May 18, 1929 | Compound rust preventive heavy | Heavy grease |
| | U. S. Navy Bureau of Ships | 52-C-18 Type I Mar. 15, 1941 | Compound rust film preventive, thin type (Polar Type) | Solvent type material, leaving tough film on metal |
| | U. S. Army Ordnance | AXS-673 Jan. 16, 1942 | Compound, rust preventive, lead base* | |
| | Army Navy Aeronautical | AN-C-52 Aug. 31, 1942 | Compound, exterior surface. Corrosion prevention. Type I. Cold application material | |
| II. Engine, preservation lubricant | Army Navy Aeronautical | AN-VV-C-576 Dec. 30, 1941 | Compound, corrosion preventive aircraft engine | Oil type additive base to be used with lubricating oil. |
| | U. S. Army | 2-126 Aug. 6, 1946 | Oil, engine preservative | Lubricating oil |
| III. Lubricating preservative for small arms | U. S. Army | 2-120 Mar. 25, 1944 | Oil, lubricating preservative, special | Low viscosity, low pour point oil with high V. I. |
| IV. Non-oxidizing thin film preservative for small parts | Army Navy Aeronautical | AN-C-124 Aug. 1, 1944 | Compound, soft film corrosion-preventive | *Type 1:* Cold application, solvent type material *Type 2:* Hot application. Grease type material. Both leaving thin film on metal recommended use for bearings |
| | U. S. Army Ordnance | AXS-1759 July 1, 1947 | Compound rust preventive, soft film | Solvent type, leaving very thin film |
| V. Fingerprint remover temporary rust preventive | U. S. Army Ordnance | AXS-1719 Dec. 10, 1945 | Oil, fingerprint remover | Solvent type material leaving extremely thin film on metal |
| | Army Air Forces | AAF 14156 Mar. 4, 1946 | Compound, cleaning fingerprint removal for metal | |
| VI. Heavy, pigmented material for special use on ships, mainly for spraying surfaces of wood and metal | U. U. Maritime Commission | 52-MC-602 Oct. 19 1945 | Compound, rust preventive Type C—heavy, pigmented | Heavy grease type material carrying rust inhibitors including chromate compounds and pigment, leaving a thick hard film on coated surface |

*"Lead Base" was omitted in all further revisions and substituted with "Thin Film."

## CHEMICAL ADDITIVES

A protective coating, in order to withstand severe exposure conditions, has to be reinforced by chemical means. The so-called "polar" compounds, which have electrically-unbalanced constituents, are ideal materials for this purpose.[8]

Chemical combinations with electropolar groups have excellent possibilities as rust preventives, for these groups have a strong tendency to orient themselves and are able to form a firm molecular film on the metal surface. This adherence of the polar group to the metal is so strong that there is no area available on the metal surface for any oxygen and water. However, either a depleting of this oriented layer by the emulsifying action of water or a mechanical rupture of the film will permit corrosion.

Materials with sufficient polarity, i.e., metal soaps and common degras were known and recommended as additives to petroleum bases for rust preventives as early as 1923.[25, 26] Early developments cover the use of petroleum sulphonates,[27, 28] the so-called mahogany soaps, manufactured as by-products of the white oil industry.

In the past 25 years it has been shown that a large number of products can efficiently be used as rust preventives such as ethers, esters, nitrogen compounds, phosphorus compounds and organic carboxylic acids. Those additives in commercial use contain a combination of compounds, each designed to perform one or more definite functions, i.e., water displacement, hydrobromic acid neutralization, fingerprint contamination removal, etc.

A study of the literature reveals that real progress has been made since about 1940.[8] A large number of patents deal with products that fall within the foregoing chemical groups, and which are claimed to have corrosion preventive properties. For example, fumaric or maleic acid esters and their derivatives were patented by Barnum and Zublin in 1945.[29] Products of this type have protective action on bearing alloys. Ether type compounds with free carboxylic acids were also cited the same year,[30] e.g., dilauric-acid sulfide, which, according to the inventors, imparts excellent salt water protection to rust preventive bases.

The protective value of ester type products in combination with petroleum sulphonates was noted by Sharp in 1945,[31] when sorbitan monooleate was recommended to protect interiors of internal combustion engines during storage.

Nitrogen derivatives are used to neutralize acidic products of combustion; they are also recommended in conjunction with other rust preventive bases already mentioned, e.g., sodium petroleum sulfonates.

Benning, Benton and Clarkson found wide application for phosphorus compounds[32] in the rust preventive field in 1937.

By utilizing the principle of protection achieved with nitrogen and metallic compounds, Smith, Cantrell and Peters incorporated these features into a single molecule and synthesized aluminum and calcium derivatives of phthalyl alkide amides.[33, 34]

The use of unsaponifiable oxidized petrolatum was recommended by Burwell in 1938.[35] Saponifiable oxidized petrolatum in the form of metallic soaps, used in conjunction with other type metallic soaps and petroleum sulfonates, were recently applied by Wilson and Dodge.[36]

The examples given for corrosion preventive combinations are quite typical, but far from representing the entire field of compounds. These chemicals comprise the active part of the corrosion preventive coatings and are incorporated, depending on the products, into a suitable vehicle in concentrations varying from 0.1 to 10 per cent.

## PETROLEUM VEHICLES

Obviously, the nature of the additive determines the usefulness of the corrosion preventive; the nature of the vehicle determines its physical characteristics. Significantly, additive and vehicle are not independent components. Some additives are useful in one vehicle and useless in a different one. Therefore, it is important to know what type carrier must be employed before a corrosion problem can be tackled.

Oil type corrosion preventives find general application as instrument oils, protectives for small arms, preservatives and lubricants in internal combustion engines, protective coats for steel bars, packaged goods, sheet steel, etc. They provide satisfactory protection for sheltered parts,

wherever the coating can be protected from mechanical injury. This is the case in the inside of machinery, e.g., engine interiors, crankshafts, etc. They can also be used where the treated parts are additionally wrapped in paper.

Grease type coatings, just as well as solvent type products, enjoy a substantial market. Depending on the nature of the specific coat, they can be used for long-term inside and outside storage of large parts and even fully assembled machinery. Thinner coats are usually recommended for inside storage, while properly inhibited heavy coats give satisfactory protection for outside storage.

## PIGMENTS AND CHROMATES

In some cases, besides the vehicle and the polar rust preventive inhibitor, other types of materials are also incorporated. There are specifications calling for pigments[38] to increase mechanical protection, while others call for water soluble chromates,[39] whose presence will passivate the metal by its oxidizing action and thus make it inert to the corrosive action of water (in case the mechanical and chemical protection of the oily or greasy coat is ruptured).

Waxes certainly have the property of mechanical protection, but due mainly to their rigidity and poor adhesion they are very seldom used by themselves as a protective coating applied directly to a metal surface. They do, however, find wide application—as sealers—in outside wrappings. Army and Navy packaging specification gANP 115 lists detailed requirements for these products.

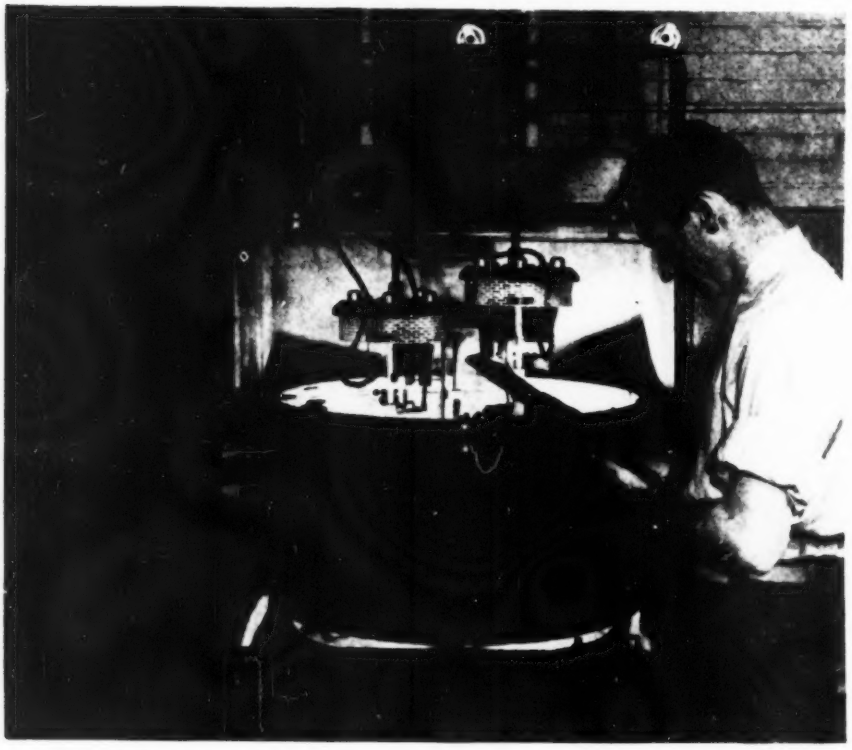
The problem of wrapping and packaging for further storage and shipment of already rust-proofed metal involves a field by itself. Nevertheless, mention should be made of moisture-proof packages in which silica gel is used to keep the moisture content of the package at a low level.[37, 40] The packaging of metal into strippable plastics for protective purposes[37, 41, 42] is also a field by itself not strictly related to that of the temporary rust preventive coatings.

## PROSPECTS

The quality of temporary rust preventive materials has improved considerably during the past few years. Humidity test requirements of 200-300 hours at 100° F. or 120° F. and 100% relative humidity can easily be met with oil type products. With the knowledge gained through development work and also revealed in the patent literature, it is not a difficult problem for the rust preventive chemist to make solvent or grease type coatings which will withstand salt spray test exposure for a month or more.

It is now well recognized which type material can be expected to give desired performance characteristics, but this is done only on an empirical basis. Chemists working in this special field are becoming more aware of the need for more basic knowledge. What are the physical chemical determining factors of corrosion preventive materials? What is the measurable reason why one combination gives better results in protection tests than another very similar one? These are but two questions.

There must be developed methods which would enable researchers to tell in advance how long a material can be expected to stand up under any of the well-controlled accelerated tests. On the other hand, there is a very real need for proper correlation of laboratory tests and actual service conditions. If all parties concerned, that is, industry, scientific institutions, and Government laboratories, will pool their efforts in a cooperative program to seek fundamental data, the funds invested will provide ample returns in the form of tons of metal saved from corrosion disintegration.



**Cabinet, with humidity controlled at 100 per cent, is used to test steel sample plates coated with a corrosion preventive. Temperature can be varied to regulate severity of the test.**

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A CI REPORT ON

# DRYING OILS

## Part 1: Theory of Drying, Natural Oils

by GEORGE M. SUTHEIM*

**DRYING OILS are the basis of such important manufactures as paint, varnish, printing ink, linoleum, and oilcloth. The nature of and the conditions for drying are thus problems of utmost consequence, and research has shed considerable light on their fundamental aspects. The natural oils are valuable, but they are attended by disadvantages of fluctuating prices and supply, variations in quality, and inherent structural deficiencies. Newly-won knowledge, bolstering centuries-old experience, is now enabling chemists to understand them better and to use them more effectively.**

EVERYONE knows what the word *oil* means, but when it comes to eliciting an adequate, scientific definition, serious difficulties arise. Of old, almost anything that had a certain "oily" consistency was called an oil—oil of vitriol, for example.

A description, rather than a definition, of our notion of oils is about the following: Oils are water-white to deep brown liquids of semi-viscous consistency at room temperature, immiscible with water and usually lighter than water, having a typical greasy, but not sticky, feeling to touch. Even this description is not a good one; there are many oils of great technical importance which do not fit into this frame at all. Sulfated castor oil, for example, is miscible with water; heavy bodied varnish oils have a specific gravity close to, or even above, unity.

In order to bring some system into this broad field, subdivision is necessary. First, we can dispense with the so-called essential oils, volatile oils of strong aromatic odor used for perfumes. In contrast to these, the oils we are concerned with here are referred to as nonvolatile, or fixed, oils.

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A further subdivision of the nonvolatile oils can be made according to their origin:

### NONVOLATILE OILS

*Mineral oils,* which are chemically impure aliphatic hydrocarbons with admixtures of varying amounts of aromatic and heterocyclic hydrocarbons, as well as acids, esters and ketones. They are, as the name indicates, of mineral origin.

*Fatty oils,* which are esters of higher fatty acids with glycerol. Their origin is the vegetable or animal kingdom.

To these two groups we may add, as a newcomer in the field, the *synthetic oils,* which are polymerization or condensation products.

The vast group of fatty oils is further classified into non-drying, semi-drying and drying oils, according to the degree with which these oils absorb oxygen from the air and thereby become solid; but drying properties are not sharply defined and the fields frequently overlap.

Oil drying is a function of unsaturation, which finds numerical expression in the iodine value. Drying oils show a high degree of unsaturation, and, a correspondingly high iodine value (see Table 1).

It seems that both plants and animals are capable of synthesizing fatty materials from other building stones. The plants are more versatile in this respect, but occasionally the animal organism seems to be also capable of transforming carbohydrates into fats.

One of the major riddles in the field of natural oils and fats is the fact that, almost without exception, only the fatty acids with an even number of carbon atoms occur, such as $C_{12}$, $C_{16}$, $C_{18}$, $C_{20}$, $C_{22}$, and $C_{24}$. Among these the $C_{18}$ fats are by far the most important. The relationship between carbohydrates and fats offers a possible explanation of this puzzling question: Since the carbohydrates contain structural units composed of six carbon atoms, it may be that two such units provide the building stones for the $C_{12}$ (lauric) chain, three units, for the all-important $C_{18}$ (stearic, oleic, linoleic, etc.) chains, and four units, for the $C_{24}$ (lignoceric) chain. For reasons, quite unknown at present, a $C_{18}$ chain seems to be able to split off a minimum of two carbons, thereby promoting a $C_{16}$ (palmitic) chain; or a $C_{24}$ chain, to get rid of two or four carbons, giving rise to formation of $C_{22}$ (behenic, erucic) or $C_{20}$ (arachidic) chains.[6, 11]†

The oils in the seeds of plants are produced during the ripening period. Analyses[1, 6] of unripe fruits and seeds

† The bibliography will appear next month with Part 2.

**Table 1—Classification of Oils and Fats**

| *Group* | *Iodine Value* | *Important Representatives* |
|---|---|---|
| Non-drying oils and fats | below 100 | Milkfats, Lard, Olive and Palm Oil |
| Semi-drying oils | 100-135 | Cottonseed, Sunflower and Soybean Oil |
| Drying oils | above 135 | Linseed, Tung, Oiticica and Fish Oil |

**Table 2—U. S. Utilization of Drying Oils, By Type of Product**

(*Millions of lbs.*)

| Type of Product | 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | 1943 | 1944 | 1945 | 1946 |
|---|---|---|---|---|---|---|---|---|---|---|
| Paint and Varnish | 701.0 | 564.8 | 676.0 | 654.2 | 886.2 | 774.5 | 688.1 | 668.3 | 634.0 | 656.0 |
| Linoleum and Oilcloth | 101.4 | 84.1 | 107.7 | 111.8 | 136.8 | 116.2 | 74.5 | 83.4 | 77.9 | 83.6 |
| Printing Ink | 26.2 | 21.9 | 22.8 | 21.2 | 29.3 | 17.3 | 22.5 | 30.0 | 37.3 | 33.0 |
| Other | 22.6 | 14.1 | 18.9 | 22.2 | 38.9 | 65.9 | 90.0 | 103.3 | 103.8 | 115.6 |
| Total | 851.2 | 684.9 | 825.5 | 809.4 | 1091.2 | 974.0 | 875.0 | 885.0 | 853.0 | 888.5 |

**Table 3—U. S. Utilization of Drying Oils, By Type of Oil**

(Millions of lbs.)

| Type of Oil | 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | 1943 | 1944 | 1945 | 1946 |
|---|---|---|---|---|---|---|---|---|---|---|
| Linseed | 584.8 | 486.8 | 557.9 | 586.9 | 808.6 | 820.2 | 757.7 | 688.4 | 639.6 | 669.8 |
| Perilla | 39.7 | 41.9 | 52.2 | 19.5 | 8.6 | 2.7 | 2.0 | 0.4 | 0.2 | 0.1 |
| Tung | 148.2 | 90.3 | 105.6 | 66.9 | 68.5 | 11.8 | 12.0 | 10.1 | 21.6 | 36.3 |
| Oiticica | 3.6 | 5.3 | 18.9 | 15.5 | 36.6 | 9.2 | 3.6 | 10.7 | 19.4 | 25.2 |
| Castor | 7.7 | 6.0 | 11.8 | 24.9 | 46.3 | 62.8 | 25.0 | 90.0 | 66.7 | 38.2 |
| Fish | 45.6 | 30.7 | 43.6 | 46.9 | 56.5 | 31.8 | 34.2 | 47.2 | 57.3 | 46.2 |
| Soybean | 18.8 | 21.8 | 33.4 | 46.2 | 62.4 | 33.4 | 39.0 | 36.6 | 45.8 | 68.1 |
| All others | 2.7 | 2.1 | 2.2 | 2.8 | 3.6 | 2.0 | 1.6 | 1.4 | 2.6 | 5.1 |
| Total | 851.2 | 684.9 | 825.5 | 809.4 | 1091.2 | 974.0 | 875.0 | 885.0 | 853.0 | 888.5 |

Source: U. S. Dept. of Agriculture, The Fats and Oils Situation, July, 1947.

show a high percentage of carbohydrates; then, within a relatively short period of time, the oil content goes sharply up, whereas the carbohydrates decrease. It is also noteworthy that oils from tropical plants are usually more of the saturated, non-drying type, whereas plants growing in the more temperate zones produce oils of more unsaturated type.

### OILS IN WORLD ECONOMICS

The fatty oils are an important commodity everywhere in the world and also in international trade. It is estimated[60] that the annual world production of the major fats and oils averaged, in the years before World War II, 43 billion lbs. (against an estimated 600 billion lbs. of mineral oils). Within this total, about 27 billion lbs. were oils of the non-drying type, some 13 billion lbs. of the semi-drying type, and a mere 3 billion lbs. of drying oils.[1]

Because of war disturbances, the annual production shrank in 1946 to about 35 billion lbs., i.e., 20 per cent less than before the war. This decrease of production has left the world with an inadequate supply of fats and oils of all types. The decline is still more impressive in terms of world trade, which averaged 13 billion lbs. before the war, and fell to an average of 5 billion lbs. in 1942-45.[60]

In this country the production of fats and oils from domestic materials reached an all-time high during the season 1946-47 (ending September) with 9.5 billion lbs.; estimates for the present season place the production close to the 10 billion-lb. mark. (U. S. Department of Agriculture, Washington, D. C.)

By far the largest quantity of fats and oils is used for edible purposes. Another large amount goes into the manufacture of soaps, detergents, and lubricants. In addition there are innumerable minor uses for the fatty oils. Drying oils are almost exclusively used in the paint, varnish, printing ink and linoleum industries.

Castor beans, which grow well in warm climates, are being harvested by coolies in Manchuria.

## THEORETICAL ASPECTS

The term *drying oils* refers to their ability to become solid when coated out in a thin film. It is not a very fortunate expression, since *drying* is commonly employed to express the loss of moisture by evaporation.

The drying of the drying oils is something entirely different: It is a chemical process. When oils of this type are exposed to the air, they are gradually transformed from liquids into solids. They don't lose weight thereby, as would be the case if evaporation of some volatile portion were the cause of their drying; on the contrary, a definite increase of weight takes place. The solidification is due to absorption of oxygen from the air, as well as to polymerization and molecular aggregation.

Closely related to oil-drying is the phenomenon of oil-bodying. When an oil of the drying type is heated to elevated temperatures, a gradual increase of viscosity is observed which terminates in the formation of a solid gel. From a purely physical viewpoint both phenomena represent the transformation of a liquid into a solid (through many intermediary stages). For the better understanding of the occurrence it is important to examine the physical reasons in general for such change in the state of aggregation.

### MOLECULAR GROWTH

The kinetic theory of matter explains the liquid state of matter as follows: The particles in liquids move at random and with considerable speed within the volume occupied, due to the thermal energy content. In solids, on the other hand, the particles execute only slight oscillatory movements around fixed points. Whenever the motion of liquid particles is sufficiently slowed down, the liquid transforms into a solid.

The actual causes for the slowing down, as well as the time the process takes, may be quite different; but the ultimate effect is always the same. When water freezes, the particles are slowed down by withdrawal of thermal energy. When the solvent evaporates from a solution, the original volume is gradually decreased until the dissolved particles come into sufficiently close proximity to give the cohesive forces a chance to act and to overpower the kinetic energy of the freely moving particles in the original solution. When an oil dries or bodies, the cause for the slowing down of the particles is intermolecular growth.

The particles in liquid oils are relatively small and move freely within the system.

Drying oils can be stored indefinitely without becoming solid; but when the proper conditions for drying or bodying are created, the oil molecules begin to interact. Two, four, or many molecules join to give larger structures. If the joining forces are of a chemical nature (valence forces) polymolecules are produced; if the joining forces are of physical nature (secondary valence, or cohesive forces) large secondary aggregates are formed. Whichever it is, the larger the particles become, the slower their motion (and the higher the viscosity of the system) until, at a certain point, all free motion is arrested. Then a solid film is formed in the case of oil-drying, and a gel, in the case of oil-bodying.

Drying and bodying are thus phenomena of intermolecular growth. Oils of the non-drying type do not dry or body, because they lack the ability to combine intermolecularly. The drying oils, then, differ from the non-drying type merely in the presence of unsaturated groups in the hydrocarbon chain of the former; but the mere presence of such groups is not a sufficient explanation. Fatty acids of the unsaturated type, for instance, carry the same functional groups, but they neither dry nor body. Only if two or more unsaturated fatty acids are linked together to form polyfunctional structures, are the conditions for molecular growth present.

Accordingly, the study of the mechanisms of oil-drying and oil-bodying must be approached from two angles: Chemical considerations will throw some light upon the specific reactions which serve to link the molecules together; structural considerations, on the other hand, represented by the recent theory of functionality, will give the general rules governing growth.

## NATURAL DRYING OILS

Chemically, the natural drying oils are the glycerol esters of unsaturated fatty acids. Since glycerol is a trivalent alcohol and the fatty acids, monobasic compounds, the esters formed can be mono-, di-, or triglycerides.

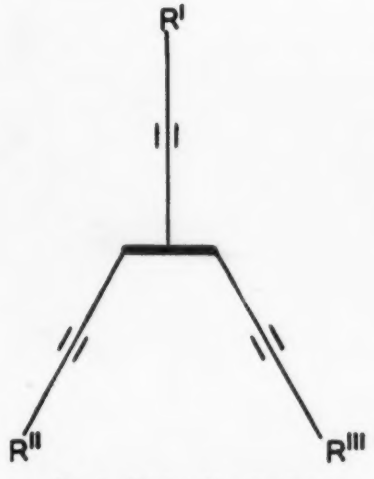



Fig. 1—Triglyceride structure

Usually two or even three different fatty acids are attached to the glycerol; the resulting esters are called mixed triglycerides. The differences may be in length or unsaturation, the presence of special groups in the chain, or stereoisomeric configurations. It must be mentioned, in addition, that the two end –OH groups ($\alpha$) of the glycerol are functionally different from the middle –OH group ($\beta$). All this gives rise to an almost infinite number of variations.

Simple schematic representations of the fatty oils impart a somewhat misleading picture. First, it must be always kept in mind that the fatty acids are elongated, thread-like structures, the length dimension being about ten to fifteen times the diameter of the thread. Second, they are not arranged in a plane, but they appear to be three-dimensional, spatial structures, as symbolically represented in Fig. 1. In this diagram the short horizontal line stands for the glycerol, the three long arms for the three fatty acid radicals. If R' is imagined to go straight upwards in the plane of the paper, R'' must be visualized to reach forward, toward the reader and R''', backward, away from the reader, a configuration roughly represented by the four corners of a tetrahedron. The double lines, slightly off the center of the arms, indicate the unsaturated section of the hydrocarbon chain. Blom[22] compares the structure of an oil molecule to: ". . . a three-armed polyp having a suction cup (double bond) on the foremost end of each arm with which objects (atoms and molecules) can be caught and held."

The double bonds are the points of instability within the chain. Instability, in this context, must not be looked at as a shortcoming. Saturated compounds, which lack these points of instability, are inert and lifeless. Unsaturated compounds, on the other hand, are reactive and lively, and lend themselves readily to all sorts of constructive activity. The double bonds in the unsaturated fatty acids are, indeed, the starting points of all the variegated reactions which make the drying oils so valuable.

Modern electronic theory explains this type of linkage, more appropriately, as "two pairs of shared electrons." We probably come near the truth when we say that the carbon atoms adjacent to the double bond are in a state of activation, i.e., ready to react when the proper conditions are created.

The hydrocarbon chain in the unsaturated fatty acids may contain one, two, three, and occasionally even more double bonds. It is very important where these double bonds are located. An isolated double bond, in a long chain, is very loath to react; it is virtually buried among non-reactive single bonds. Two, and also three double bonds, if separated by several single bonds, also show little readiness to react. Yet, if the double bonds are near each other, in conjugated positions, they activate one another and become powerful reactors. A pair of conjugated double bonds must be looked upon as a new functional unit of vastly increased reactivity.

Tung trees, originally from China, are now grown domestically in this Mississippi orchard.

—C—C=C—C—
1 isolated double bond
(very little reactive)

—C=C—C—C=C—
2 isolated double bonds
(little reactive)

—C=C—C=C—
2 conjugated double bond = 1 pair
(well reactive)

—C=C—C=C—C=C—
3 conjugated double bonds = 2 pairs
(very reactive)

## NOMENCLATURE OF ACIDS

There is some confusion as to the names given to the fatty acids; for most of them two or more names are used indiscriminately.

One series of names is of more or less historical origin, the words being derived

**Ripe tung nuts are shown at the left. At the right oil is being expelled from tung meal in a laboratory-size hydraulic press.**

from the names of the plants or animals in which the fatty acid was first identified: linoleic acid, for instance, from linseed; or palmitic, from palms. Such names are misleading in so far as they imply that the acid is distinctive for the particular oil, which is not always the case. Linseed oil, for example, contains several other fatty acids, and linoleic acid is an important constituent of many other vegetable oils.

The second series of names, mostly used in scientific reports, is the official terminology accepted by the International Union of Chemistry (see *J.Am.Chem.Coc., 55,*3905 [1933]). It attributes systematically a name to each compound which gives all the essential chemical characteristics in one word. Unfortunately, the resulting names are rather complicated and not very appropriate for everyday use; but they can be readily interpreted if the guiding principle of these word-constructions is understood.

The core of the name is, in all cases, the number of C-atoms linked in a straight chain, expressed in Greek numerals; by adding a special suffix, the characteristics of the compound are indicated:

| Number of C-atoms in straight chain: | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
|---|---|---|---|---|---|---|---|
| Corresponding Greek numerals: | dodeca | tetradeca | hexadeca | octadeca | eicosa | docosa | tetracosa |
| For fatty acid: | saturated | mono-unsaturated | | di-unsaturated | | tri-unsaturated | |
| Suffix added: | -noic | -enoic* | | -dienoic | | -trienoic | |

* *a* changes into *e*, e.g., octadecenoic.

To characterize the location of the unsaturation, the carbon atoms are numbered, starting with that of the carboxyl group. The number of the carbon atom after which the double bond appears is set before the word. Other special groups are indicated by putting the name of the group before the word and also adding a number to denote the location.

Examples (see also Table 4):

*Octadecanoic acid,* a saturated $C_{18}$ acid, i.e., stearic acid;

*9-Octadecenoic acid,* a mono-unsaturated $C_{18}$ acid with the double bond after the ninth carbon atom, i.e., oleic acid;

*9,12-Octadecadienoic acid,* a di-unsaturated $C_{18}$ acid, with the double bonds after the ninth and the twelfth carbons, i.e., linoleic acid;

*12-Hydroxy-9-octadecenoic acid,* a mono-unsaturated $C_{18}$ acid, with the double bond after the ninth, and an extra hydroxyl group at the twelfth carbon, i.e., ricinoleic acid.

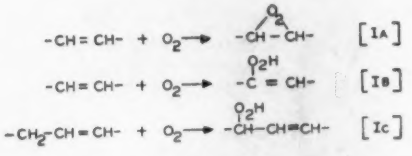
A third nomenclature, which does away with the word monsters of the international names, has made its appearance in the literature. Instead of using the awkward Greek numerals, it simply says $C_{16}$ or $C_{18}$, and constructs symbols like 9,12-$C_{18}$dienoic acid, which is short, easy to remember and self-explanatory in the light of the terminology indicated above.

## CHEMICAL ASPECTS

The term *oil drying* is applied when oils (or combinations with other ingredients), coated out in a thin layer and exposed to the air, solidify. It is thus an oxidation process, where oil molecules are locked together at the unsaturated spots with an oxygen atom (ether linkage) as a bridge.

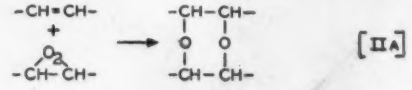
The term *oil-bodying,* on the other hand, is used when oils (or combinations with other ingredients), heated to elevated temperatures, show a gradual increase of viscosity, which eventually leads to the formation of a solid gel; oxygen does not take any part in the process. Oil molecules are locked together, again at the unsaturated spots, but by a direct carbon-to-carbon linkage without the intermediary of an oxygen:

As to the actual chemical reactions which take place when an oil dries, it is ascertained by much evidence that one molecule of $O_2$ first becomes attached to the unsaturated centers of the hydrocarbon chain. Among the numerous possible intermediaries this produced, we may mention the following:

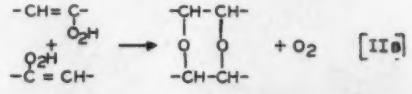


[Ia] [Ib] [Ic]

Ia postulates the formation of a peroxide, whereas Ib and Ic suggest the formation of hydroperoxides. Whichever it is, the next step, presumably, is the reaction between an oxidized molecule and another double bond, or between two oxidized molecules



[IIa]

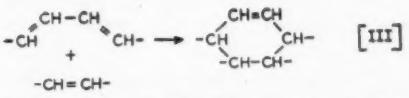


[IIb]

with formation of a dioxan ring.[4, 14, 22, 41, 67]

Since every oil molecule contains three fatty acids which may react as indicated above, there is a possibility that (1) two fatty acids attached to the same glycerol react, leading to an intramolecular ring-closure; or that (2) two fatty acids attached to two different glycerols react; this would promote intermolecular ring-closure. Which one of the two reactions will take place? Probably both. But, if we take another look at the spatial model of an oil molecule (Fig. 1), we can infer that the ring-closure within one molecule would be possible only if two fatty acid chains were sharply bent toward each other, which is not too probable. It is much easier to visualize two different oil molecules approaching one another sufficiently close to permit the intermolecular type of ring-closure to proceed. Thus, the latter reaction is more probable. It is this type of reaction, in fact, which leads to intermolecular growth.[22]

The oil-bodying reaction, as pointed out earlier, is of a different type. Here again many possible alternatives have been suggested. The most widely accepted at present is the Diels-Alder reaction, in which two conjugated double bonds react with one isolated double bond by 1,4-addition:




[III]

to give a six-membered, all-carbon ring, one of the most stable configurations known in organic chemistry.[14, 40, 52, 67]

It must be emphasized that all these reactions are highly hypothetical, and much more evidence is necessary to decide for one or the other or to offer a better solution. Only one who has actually worked in the field of oil chemistry can appreciate the overwhelming difficulties encountered with these ever-changing, viscous and gel-like substances.

But the predicament is not as bad as it may appear: It is not too important to know to the last detail what goes on when oils dry or body. The theory of functionality, instead of examining each specific reaction as such, looks at the general principles of all reactions that may lead to molecular growth.

## CONCEPT OF FUNCTIONALITY

The concept of functionality was originally developed by Carothers[30] and Kienle[42] to clarify the working principles of polycondensation reactions. It was later extended by Bradley[25] to the reactions of oil-drying and oil-bodying.

Any group in an organic compound with the potential ability to serve as a link between molecules is regarded as functional. With one functional group, a molecule is monofunctional (symbol: Rx, or R'y), with two groups, bifunctional (symbol: xRx, or xR'y), with three functional groups, trifunctional (xRx, or $\begin{matrix}x\\ R'y\end{matrix}$, or xR"y). The R, R', or R" in $\begin{matrix}x\\ z\end{matrix}$ these symbols stand for any possible molecular configuration which happens to be the carrier of a functional group; x, y, and z, for the functional groups themselves. Of course, a group is functional only with respect to a possible reaction; e.g., the –OH group in an alcohol is functional if another functional group to react with it is present in the system—a –COOH group, say, with which it can form an ester.

A reaction between two monofunctional compounds is called a monofunctional reaction, represented symbolically by:

$$Rx + xR \longrightarrow R - R \quad [IVa]$$

$$\text{or } Rx + yR' \longrightarrow R - R' \quad [IVb]$$

When two functional groups react, they disappear. The monofunctional reaction is terminated with the formation of a two-unit molecule. Nothing further can happen.

A reaction between a mono- and a bifunctional compound is called mono-bifunctional; it takes the following course:

$$Rx + xR'x \longrightarrow R - R'x \quad [Va]$$

$$\text{or } Rx + yR''y \longrightarrow R - R''y \quad [Vb]$$

The reaction product has one functional group left and consequently behaves like any other monofunctional compound (Equ. IV).

A reaction between two bifunctional substances, called a bi-bifunctional reaction, takes a very different course:

$$xRx + xRx \longrightarrow xR - Rx \quad [VIa]$$

$$\text{or } xR'y + xR'y \longrightarrow xR' - R'y \quad [VIb]$$

In either case the reaction product is bifunctional, just as the reactors at the start. Accordingly a bi-bifunctional reaction can keep on going (theoretically infinitely):

$$xR - Rx \xrightarrow{xRx} xR - R - Rx \xrightarrow{n(xRx)} \begin{matrix}xR - (R)_n - Rx\end{matrix} \quad [VIc]$$

yielding chain-like (linear) polymolecules of ever-increasing length.

If at least one of the reactors is trifunctional (or higher) the reaction gives an entirely different picture; e.g., the following bi-trifunctional reaction:

$$\underset{y}{xRx} + \underset{y}{yR'y} \longrightarrow \underset{y}{xR - R'y} \quad [VIIa]$$

The reaction product is trifunctional and the reaction may proceed in many different ways, one of which may be the following:

$$\underset{y}{xR - R'y} \xrightarrow{2\,xRx} \underset{\begin{matrix}|\\ Rx\end{matrix}}{xR - R' - Rx}$$

$$\xrightarrow{\underset{y}{yR'y}} xR - \underset{\begin{matrix}|\\ R - R'y\\ y\end{matrix}}{R'} - Rx \text{ etc.} \quad [VIIb]$$

From this scheme two remarkable conclusions can be drawn. First, every time a trifunctional molecule enters the reaction, the functionality of the reaction product increases by one; thus, after a slow start the reaction has a self-propelling acceleration. Second, every time a trifunctional molecule reacts, the molecular growth branches out into space; thus, polyreactions in which at least one of the reactors is trifunctional or higher will lead to tridimensional polymolecules.

Reactions of higher order than trifunctional are not different from the trifunctional type with respect to the spatial arrangement of the resulting polymer; yet, the functionality of such reactions increases more rapidly and thus the speed of the reaction is greater and the branching-out into space more marked.

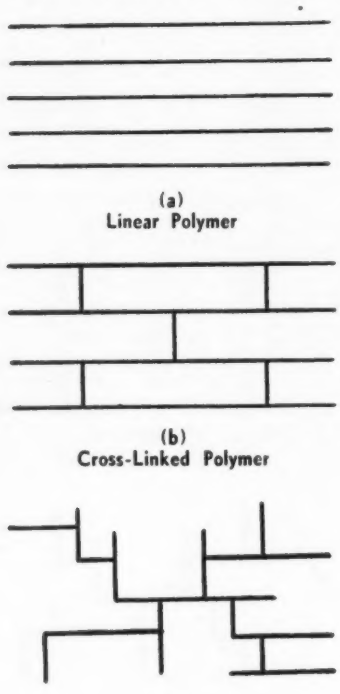
## GROWTH FROM THIS VIEWPOINT

In terms of functionality the rules of molecular growth can be summarized as follows:

**Table 4—Approximate Composition of Some Fatty Oils** [6, 8, 26, 58]

| *Type of Fatty Acid* | *Number of Double Bonds* | | *Natural* | | | | | | | | | | | *Modified Natural* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Common Name* | *iso-lated* | *conju-gated* | *Non-Drying* | | *Semi-Drying* | | | *Drying* | | | | | | | | |
| | | | *Olive* | *Castor* | *Cotton Seed* | *Soybean* | *Sun-flower* | *Linseed* | *Perilla* | *Tung* | *Oiticica* | *Fish Menhaden* | *Fish Sardine* | *dehydr. Castor* | *isomerized Linseed* | *isomerized Soybean* |
| Myristic | 0 | 0 | 1.1 | .... | 2.0 | 0.3 | .... | .... | .... | .... | .... | 5.0 | 6.0 | .... | .... | .... |
| Palmitic | 0 | 0 | 9.7 | .... | 21.2 | 9.8 | 3.5 | .... | .... | 3.7 | .... | 16.0 | 10.0 | .... | .... | 10.0 |
| Stearic | 0 | 0 | 1.9 | 3.0 | 1.9 | 3.3 | 3.9 | 5.5 | 7.6 | 1.4 | 11.0 | 1.5 | 2.0 | 3.0 | 5.0 | 3.5 |
| Oleic | 1 | 0 | 79.8 | 9.0 | 29.6 | 28.9 | 34.1 | 10.0 | 3.9 | 10.0 | 16.0 | 15.5 | 13.0 | 9.0 | 10.0 | 29.0 |
| Ricinoleic | 1 | 0 | .... | 85.0 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 6.0 | .... | .... |
| | 2 | 0 | 7.5 | 3.0 | 45.3 | 51.2 | 58.5 | 42.8 | 44.3 | 0.6 | .... | 30.0 | 24.0 | 61.0 | 7.0 | 7.5 |
| Linoleic | 2 | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 21.0 | .... | .... |
| | 2 | 2 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 36.0 | 44.0 |
| Linolenic | 3 | 0 | .... | .... | .... | 6.5 | ... | 41.7 | 44.2 | .... | .... | .... | .... | .... | 32.0 | 4.0 |
| Eleostearic | 3 | 0 | .... | .... | .... | .... | .... | .... | .... | 84.3 | .... | .... | .... | .... | 10.0 | 2.0 |
| Licanic | 3 | 3 | .... | .... | .... | .... | .... | .... | .... | .... | 73.0 | .... | .... | .... | .... | .... |
| Arachidonic | 4 | 0 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 19.0 | 26.0 | .... | .... | .... |
| Clupanodonic | 5 | 0 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 12.0 | 19.0 | .... | .... | .... |

Fig. 2—Types of Molecular Growth



(a)
Linear Polymer

(b)
Cross-Linked Polymer

(c)
Branched Polymer

*Monofunctional substances,* e.g., monovalent alcohols, monobasic acids, or mono-unsaturated compounds, cannot form polymolecules by themselves. Their reactivity is exhausted with the formation of dimers. If monofunctional molecules enter reactions of higher functionality, they will always be "terminal," (i.e., terminate further reaction at the spot where they enter).

*Bifunctional substances,* e.g., the glycols, or dibasic acids, like maleic, succinic, or phthalic acid, or unsaturated compounds with two centers of unsaturation, promote molecular growth in only one direction. Such polymers may grow to very high molecular weight and attain high viscosity or become solid. Yet the reaction product will always consist of alignments, or aggregations of thread-like, monodimensional molecules, held together by relatively weak secondary valence forces (Fig. 2a). Polymers of this type will remain fusible and relatively soluble.

*Tri- and higher functional substances,* e.g., glycerol or the higher polyalcohols, or unsaturated compounds with three or more centers of unsaturation, promote molecular growth in all directions of space. Such polymolecules grow to lamellar (2-dimensional) or corpuscular (3-dimensional) rigid structures, held together by strong valence forces. If only a few tri- or higher functional molecules participate in the reaction, cross-linkings or bridges will be established between essentially linear polymolecules (Fig. 2b). If the majority of the reacting molecules is of the tri- or higher functional type, branching-out in all directions will be the result (Fig. 2c). Reactions of this sort very rapidly give highly viscous or gel products, and, if carried far enough, the reaction product will become infusible and insoluble. Polymers of this type may be looked upon as super-giant molecules.

## APPLICATION OF CONCEPT

The first question to answer in this connection is: What is the functionality of the fatty acids and the drying oils?

An unsaturated fatty acid has two different kinds of functional groups:

(1) *the –COOH group,* which confers monofunctionality; as such it can form esters and like substances, but once the reaction is completed this functional group ceases to exist. Fatty acids, if reacting with their –COOH group, will always be terminal.

(2) *the centers of unsaturation;* each double bond in a fatty acid chain is potentially functional. Yet, as pointed out before, isolated double bonds are present in conjugated positions, or if conjugation is promoted (through isomerization) in the course of the reaction, the centers of unsaturation may be called functional in the sense of the definition, i.e., leading to molecular growth. Two conjugated double bonds (equal one pair) make the fatty acid monofunctional, three conjugated double bonds (equal two pairs), bifunctional.

Since in a natural oil three fatty acids are linked together, the functionality of the oil is three times that of the fatty acids it is composed of. If "isomerized linseed oil" were purely the triglyceride of 10,12-octadecadienoic acid, it would be trifunctional; and if tung oil were the pure triglyceride of 9,11,13-octadecatrienoic acid it would be hexafunctional. In reality, isomerized linseed oil is only in part trifunctional, since large proportions of nonconjugated acids are present. Tung oil, however, comes close to the theoretical picture of a hexafunctional oil.

Equipped with this knowledge, some of the questions in the field of drying oils can be answered:

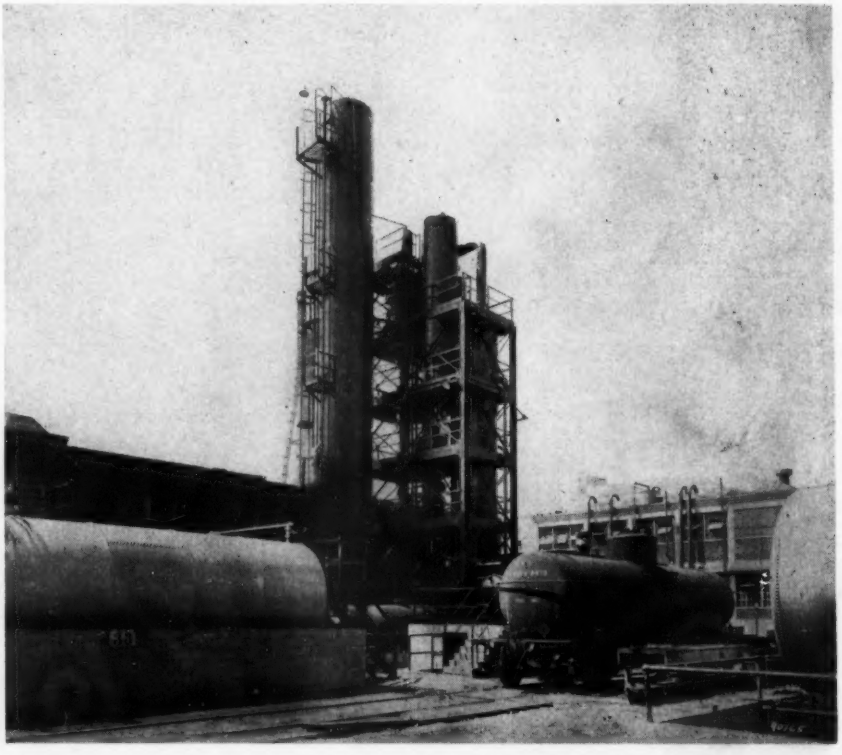
Why does an unsaturated fatty acid neither dry nor body? Because its degree of functionality is too low. The role of the glycerol in the natural drying oils appears now in an entirely different light. All the older ideas about the formation of polyglycerols, or of acrolein formation and subsequent polymerization of the latter, are now discarded. The role of the glycerol, and, in fact, of any other polyalcohol, is to build up a molecule with the necessary degree of functionality.

Taking once more, to illustrate the point, the 10,12-octadecadienoic acid, which is the valuable acid in isomerized linseed oil, it shows monofunctionality. Neither the acid itself, nor its monoester, will dry or body to any appreciable extent.

A diester of the same acid, say the glycol ester, is bifunctional. Accordingly it will form linear polymers. But they form very slowly and remain fusible and soluble.

A triester, say with glycerol, is a trifunctional molecule. Bodying and drying will, after a slow start, proceed rapidly and lead to solid, gel-like bodies. Eventually, infusible and insoluble gels will be formed. This is the picture of an excellent drying oil.

A tetraester, say with pantaerythritol,



Linseed oil is extracted by furfural in this Pittsburgh Plate Glass Co. plant in Milwaukee.

is tetrafunctional. It is superior as to bodying speed and ultimate hardness, since its higher functionality will yield more cross-linkages faster.

Practical tests with all these esters are in good agreement with the theoretical prediction.[28, 29]

### MECHANISM OF DRYING AND BODYING

Some attention to the mechanism of oil-drying and oil-bodying concludes this theoretical discussion. The problem, in its simplest form, is this: At the beginning we have a liquid oil, at the end it has become solid; what goes on in between? There is no doubt that both processes go through a number of distinct stages:

*(1) The Induction Period.* (Especially marked in oil-drying.) All natural drying oils contain some inhibitors or anti-oxidants. These little-known compounds apparently have the function of preventing the oils in the seeds from oxidizing. In spite of careful refining, some of them remain in the oil, and their presence may account for the fact that, when a drying oil is coated out, nothing happens at first. The induction period is, consequently, the time necessary for the removal of the natural inhibitors. One of the important functions of drier addition is to shorten the induction period by helping to oxidize the inhibitors. The evidence, however, is far from complete.

*(2) The Orientation Period.* The molecules in a liquid oil move ceaselessly and with considerable speed. No reaction of any kind is probable as long as the particles rush by each other without giving the functional groups a chance to act. Ordinary double bonds are weak polar centers in the long, non-polar hydrocarbon chain; they are incapable of appreciably arresting the thermal motion of the particles. But when the surface molecules of an oil film become oxidized, or when the double bonds become heat-activated, strong polar centers are created. Now much stronger attractive forces can operate; the swift motion of the molecules is momentarily arrested and the functional groups are brought into proper positions for further reaction.

*(3) The Period of Molecular Rearrangement.* At this point further reaction depends largely upon the presence of conjugated unsaturation in the oil. With conjugated oils, molecular growth now proceeds speedily (see period 4.) Non-conjugated oils, on the other hand, are still not ready to react. As pointed out before, isolated double bonds, though potentially functional, are non-reactive; but non-conjugated oils—linseed oil, for example—dry, if given enough time, and body, if heated sufficiently long at high temperatures. It is assumed that the double bonds in such oils, activated by oxidation or heat, shift to conjugated positions. Only thus does the theory explain how molecular growth can proceed.

*(4) The Period of Molecular Growth.* As to the exact type of reaction that leads thence to molecular growth, there is still wide divergence of opinion. One school of thought postulates true chemical reactions at this stage, giving rise to macromolecules. The diametrically opposite school asserts that no chemical reactions occur—that solely physical aggregations are formed. Both parties are probably right to some extent. There is general agreement that in the first stage of drying and bodying, dimers are formed. At room temperature and in the absence of highly functional reactors, it is quite probable that further molecular growth is only due to the development of micelles, i. e., structures held together by secondary valence forces. At elevated temperatures, however, and if highly functional molecules enter the reaction, the formation of true macro-molecules is likely. An air-dried linseed oil film is representative of the aggregation type; a "run-away" tung oil batch, which turns into an insoluble gel upon overheating, is a sad example of the macromolecular type; films from oleoresinous varnishes or alkyd resins may have their place somewhere in between.[17, 19, 21, 23, 66, 71]

"Weatherability" of paints, largely dependent on oil properties, is evaluated by exposure.

## NATURAL OILS

Nature presents us with a wide variety of drying and semi-drying oils from divers sources: Linseed oil, from tiny flax seeds; tung oil, from tung tree nuts; fish oil, from sardines and other small fish. Among the many other drying oils known, only a few are presently of any practical importance. (See Table 4.)

Seldom are the drying oils used straight. Mixed with inert pigments they yield the old-fashioned oil paints. Blended or chemically reacted with other ingredients, they yield oleoresinous varnishes which, in turn, are the basis for most of our protective and decorative coatings. Loaded with finely-ground cork and textile fibres, the oils go into linoleum manufacture. Coated on fabrics they product oilcloth. It is estimated that more than 90 per cent of all drying oils are used for one or another of the above commodities. Small quantities only are used in other fields; soap manufacture, detergents, lubricants and pharmaceutical preparations; very seldom are drying oils used for edible purposes.

### ECONOMICAL IMPORTANCE

World-wide, the most important drying oil is linseed. Some 50 years ago, hardly any other drying oil was used. Today the situation is rather different: Though linseed oil still occupies first place, other drying oils are used extensively, e.g. tung oil (China wood oil) for its outstanding drying properties, dehydrated castor oil for its good drying and excellent color retention, soybean and fish oil for their lower price. In addition, local conditions may make the use of one or another linseed oil substitute important: crop failures in flax seed, abundant supply of some domestic oil, political disturbances or monetary difficulties in certain countries. Among these minor oils are candlenut, chia, grapeseed, hempseed, onguekoa, poppyseed, safflower, sunflower, walnut oil, and many others. The present relative importance of the major drying oils in the United States is shown in Tables 2 and 3.

### COMPOSITION

In the discussion of chemical constitution it was pointed out that the mixed triglyceride structure of the fatty oils permits an almost infinite variation. At present some 50 well-defined fatty acids have been isolated from the natural products, varying in chain length, degree of unsaturation, position of double bonds, or functional groups. Not more than a dozen of these fatty acids are found regularly and in quantity in the technically

**Table 5—Agricultural versus Industrial Commodities, U.S.A. Maximum and Minimum Prices, 1932-1946**

| | *Linseed Oil cents per lb.* | | *Tung Oil cents per lb.* | | *Lithopone cents per lb.* | | *Benzol cents per gal.* | |
|---|---|---|---|---|---|---|---|---|
| | *High* | *Low* | *High* | *Low* | *High* | *Low* | *High* | *Low* |
| 1932 | 7.0 | 5.3 | 7.8 | 5.8 | 4.5 | 4.5 | 20 | 20 |
| 1933 | 11.0 | 6.8 | 9.6 | 5.0 | 5.0 | 4.5 | 22 | 20 |
| 1934 | 10.1 | 8.7 | 10.3 | 7.8 | 5.0 | 4.5 | 22 | 20 |
| 1935 | 10.0 | 8.7 | 37.0 | 9.5 | 5.0 | 4.5 | 22 | 19 |
| 1936 | 10.5 | 9.2 | 19.5 | 12.8 | 5.0 | 4.2 | 18 | 16 |
| 1937 | 11.3 | 10.1 | 25.0 | 11.4 | 4.8 | 4.2 | 16 | 16 |
| 1938 | 10.3 | 8.1 | 16.0 | 9.0 | 4.8 | 4.1 | 16 | 16 |
| 1939 | 11.1 | 8.5 | 28.0 | 13.8 | 4.8 | 3.6 | 16 | 16 |
| 1940 | 11.1 | 8.3 | 26.0 | 20.8 | 4.1 | 3.6 | 16 | 14 |
| 1941 | 11.7 | 9.1 | 35.5 | 25.8 | 4.4 | 3.9 | 15 | 14 |
| 1942 | 14.3 | 11.1 | 38.4 | 38.4 | 4.8 | 4.3 | 15 | 15 |
| 1943 | 15.8 | 13.2 | 38.4 | 38.4 | 4.8 | 4.3 | 15 | 15 |
| 1944 | 15.5 | 15.1 | 38.4 | 38.4 | 4.8 | 4.3 | 15 | 15 |
| 1945 | 15.5 | 15.5 | 38.4 | 38.4 | 4.8 | 4.3 | 15 | 15 |
| 1946 | 34.1 | 15.5 | 38.4 | 38.4 | 5.0 | 4.3 | 15 | 15 |

Source: *American Paint Journ.*, Convention Daily, 1941-1946.

important drying oils. Even with this comparatively small number of variables the number of possible combinations is very large, since not only the type of fatty acid can vary, but also the proportion in which it occurs in a specific oil. The composition of some of the more important oils is indicated in Table 4.

In addition to fatty acid esters, numerous nonfat materials are regularly present: phospholipids, heterocyclic compounds, proteins, and frequently vitamins; and certain entirely undefined substances, present only in traces but of baleful influence upon the properties of the oil, such as perfumes, dyes, and anti-oxidants.

## CRUSHING AND REFINING

The manufacture of natural drying oils consists of several operations. Seeds, for example, are first cleaned and then crushed, i.e., reduced to a fine meal. Then the meal is heated and pressed in hydraulic presses, first moderately, finally with pressure up to 3,000-4,000 .p.s.i. A more recent way of recovering the oil is by solvent extraction. The residues are an important cattle feed.

The raw oils, obtained by one or the other of these methods, cannot be used without further refining. As mentioned before, the oils contain objectionable impurities. Mucilaginous materials must be eliminated, which is done by heating, or by treating the oils with caustics or with sulfuric acid; solid fats and wax-like contaminations are removed by cooling and subsequent filtering; the color is improved by bleaching the oils with chemicals or with the help of adsorbents, etc.[7, 8, 67]

The consumer thus obtains light and clear drying oils, the properties of which are fairly constant within certain limits as specified by the manufacturer. Linseed oil, for example, is marketed as raw linseed oil, an oil which is merely well settled and filtered; refined linseed oil, usually specifically offered as alkali- or acid-refined; kettle linseed oil, with especially low acid value, made for further processing in the varnish kettle; grinding linseed oil, with high acid value and improved wetting properties for the pigments used in paint-making; and many other varieties for the convenience of users in various fields.[15]

## DISADVANTAGES

For all practical purposes the natural drying oils dry much too slowly. Linseed oil takes many days, or even weeks, to dry; and the film eventually formed is soft and tacky. It would be a mistake, however, to call the slowness of drying of the pure oils a real disadvantage; up to a certain extent, it can be easily corrected. Addition of driers, blending with resins, or bodying the oils at high temperatures are some of the methods used to hasten drying. These procedures were developed over centuries of experience by paint and varnish makers. Yet, in spite of the undeniable achievements in the field, no one seems to be quite satisfied. In dozens of laboratories, hundreds of able chemists work full time on attempts to improve the drying oils still further. Let us see why:

(*1*) *Variations in quality.* No natural raw material is ever uniform, especially not materials of agricultural origin. Though oil crushers do a remarkable job of supplying their customers with the best possible product, they are dependent in turn upon their supply of oil seed. Every incoming shipment varies according to the seeds' origin, the weather during their ripening, conditions during transport and storage, and many other factors.

He does his best to counteract these variations by carefully testing and selecting his raw material, working under controlled conditions, and blending different grades into large batches of uniform quality. Yet, he is never wholly successful.

(*2*) *Fluctuations in Price and Supply.* Another disadvantage, common to almost all agricultural raw materials, is inconstant cost and supply. Few items on the world markets, however, show more violent variations in this respect than the drying oils (see Table 5).

The reasons for these wild fluctuations are manifold: crop failures, of course, reduce the supply for a given year and drive the price up, bumper crops work in the opposite direction, and speculation aggravates the situation; political disturbances in the main oil-producing countries, such as China (tung oil) or Manchuria (perilla oil), and monetary difficulties in the main oil-buying countries, such as practically all European countries, are other factors that increase the uncertainty of the markets.

Table 5 speaks an eloquent language. Compare the extreme price variations of the two drying oils (until the Government put the lid on, during the war), with the relatively constant prices of lithopone and benzol, two raw materials of factory-made origin.

(*3*) *Inherent Structural Disadvantages of the Natural Drying Oils.* It was certainly not Nature's intention to make ideal drying oils when she put fatty materials in the seeds of certain plants. Accordingly we cannot expect to find the natural product as good as we may wish it to be. Why are the natural drying oils far from ideal?

(a) All natural drying oils contain fatty acids of the saturated or low-unsaturated type which have no drying value at all;

(b) Most of the natural drying oils contain the all-important double bonds in insufficient number and in unfavorable positions.

(c) All natural drying oils are esters; in consequence they are saponifiable, with the result that in practice they are well resistant to alkali.

(d) The triglyceride structure of the natural oil molecule is only one of many possible ester structures, and not the best one.

(e) The chemical reactions which lead to the solidification of the oils do not stop when the film is dry and hard enough for all practical purposes, but go on and on thereafter, terminating in the eventual destruction of the film; oil films age and decay.

(f) Films formed from natural drying oils show the phenomenon of after-yellowing, i.e., bad color retention.

Next month we shall turn to Man's attempts, in the field of drying oils, to do better than Nature.

## REPRINTS

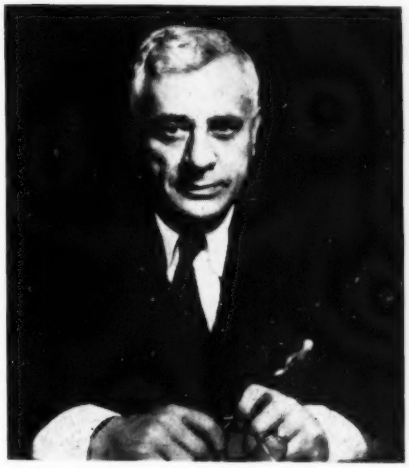
**Part 1 of this report will not be available separately in reprint form. The second and concluding part will be published next month, at which time a price schedule for reprints of the complete report will be announced.**

# THE CHEMICAL PANORAMA

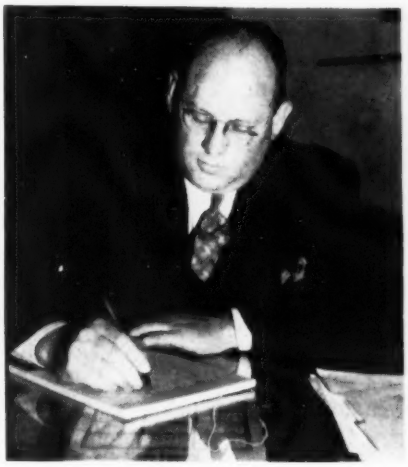
NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

## PEOPLE

Clarence W. Blake, who has been awarded the 1948 Perkin Medal of the American Section, the Society of Chemical Industry for his work on the development of tantalum



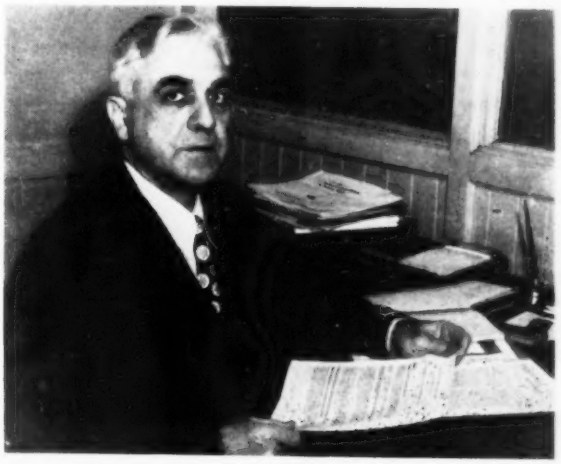
Theodore P. Walker, elected chairman of the board of directors, Commercial Solvents Corp.



Arthur B. Hersberger, named manager of the chemical products div., Atlantic Refining Co.

H. E. Bramston-Cook, appointed general manager of eastern operations, Oronite Chemical Co.

George A. Graham, appointed factory manager of the Borger, Texas, plant, U. S. Rubber Co. He was manager of the W. Va. unit.



Marvin S. Carr, who has joined the development department, Wyandotte Chemicals Corp., as assistant to the director.

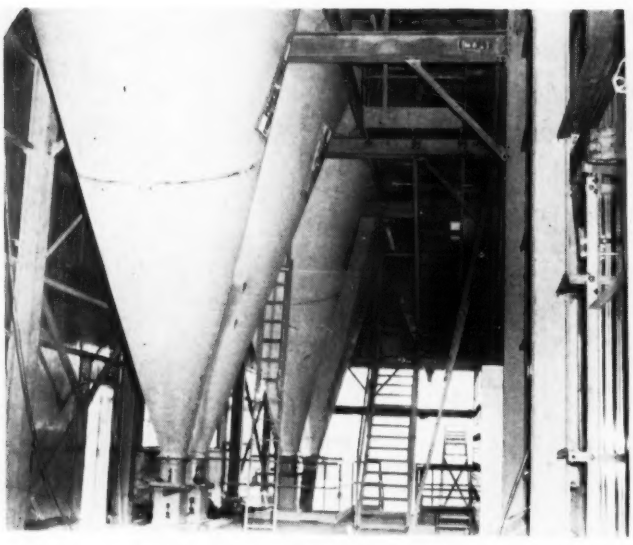
The diatomaceous earth deposit, now being exploited by Eagle-Picher, is hundreds of feet thick, and suitable for surface mining methods.

# Diatoms from Nevada

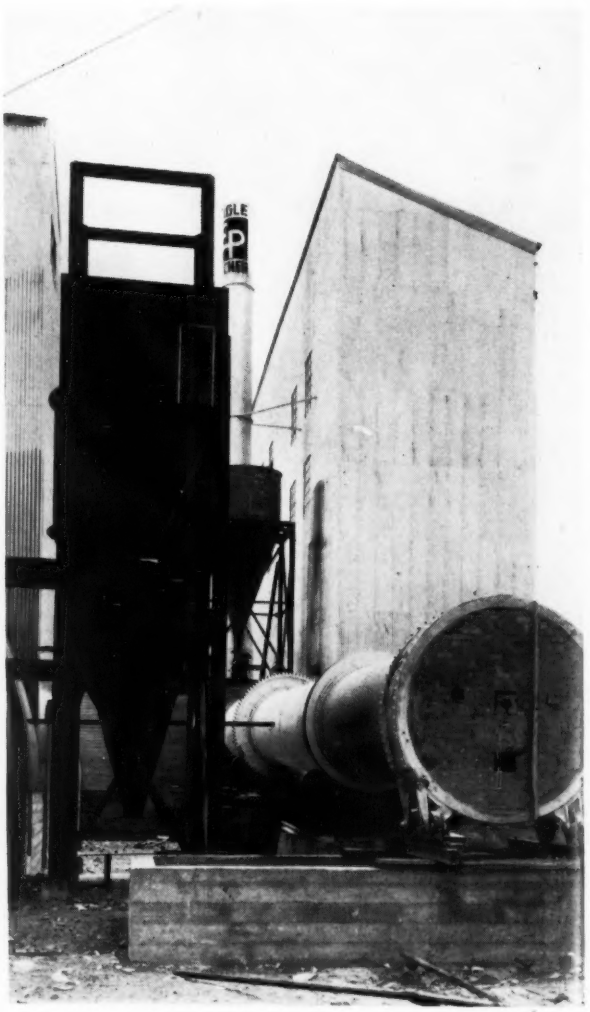
A new plant to process industrially-useful diatomaceous earth has recently been placed in operation by the Eagle-Picher Co. at Clark, Nevada. One novel feature of the extensive deposit is that, due to the arid climate of the region, bed moisture is in the 15 to 25 per cent range, contrasted with the 65 per cent moisture level encountered in some other areas. Air-drying, consequently, is expedited.

As mined, the diatomataceous earth is quite low in impurities—such as volcanic ash, clay and sand. Freight-wise, too, it is well located, lies on the main line of the Southern Pacific Railroad.

A grinding, classifying and calcining plant has been built to process the surface-mined earth. Air classification equipment was installed for the separation and blending of the diatoms into blends of various particle sizes.



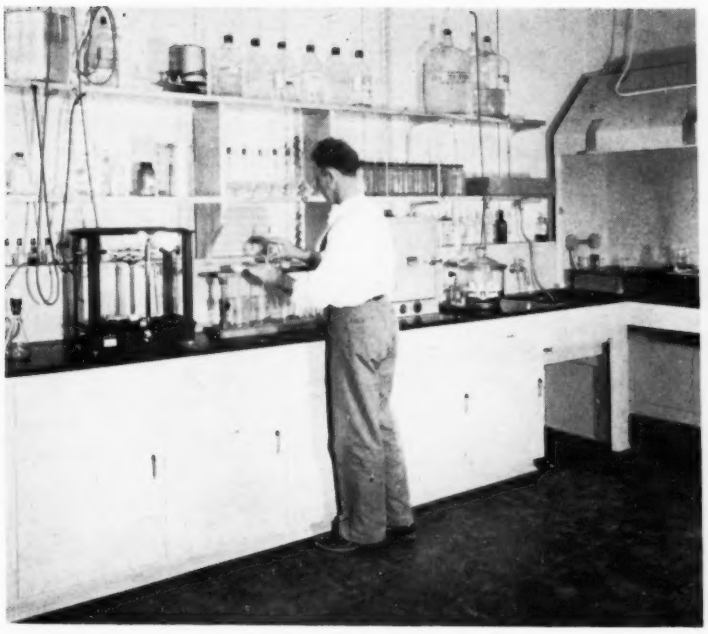
Bins contain different grades of diatoms collected from classification units. Flexibility of equipment permits blending of earths from particle size standpoint.



Calcination of earth under closely controlled conditions in rotary kiln serves to improve physical properties of natural material.

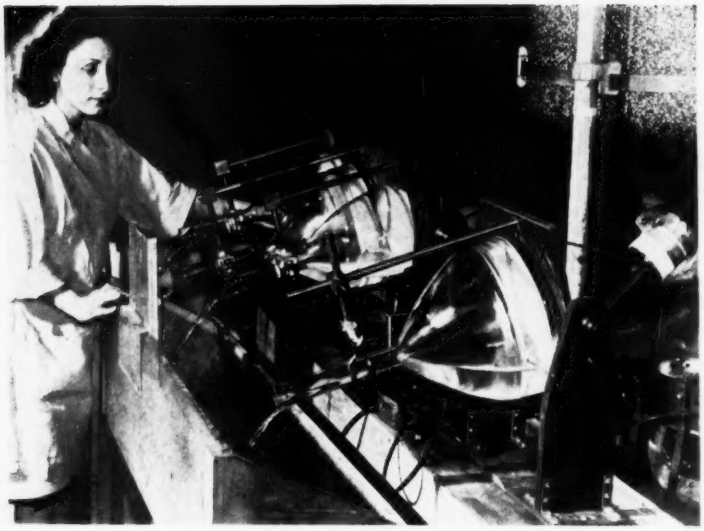
# Desert Riches

The heat of the sun has, over the course of millenniums, dried up the lake which once covered the Mojave Desert, leaving tons and tons of valuable salts at Searles Lake, 170 miles from Los Angeles. Here, at Trona, California, the American Potash & Chemical Corp. is working the dense yellow brine—containing potash, borax, soda ash, salt cake and other chemicals—which permeates the salt body. Since 1862, when the deposits at Searles Lake were first tapped, they have yielded up over nine million tons of salts; and American Potash is pumping the brine continuously at the rate of ten tons a minute. Still, industry has only begun to tap this vast reservoir. Only the upper salt layer on the exposed central portion of the lake has been drilled for wells, but exploration reveals that the valuable salts occur in layers as deep as 250 feet. It has been estimated that each square mile of lake surface to a depth of 300 feet contains 100,000,000 tons of soluble salts. In order to use these natural stores more profitably and more efficiently, American Potash has constructed a new, modern $300,000 laboratory (above), for further investigation of the resources. Constructed as a two-story addition to the administration building, at the left, the new laboratory is specifically designed and equipped to develop new products and improve processing methods. It is under the direction of W. A. Gale (left), director of research.



Interior view of one of the nine air-conditioned laboratory rooms. The building covers an area of 16,800 square feet and contains, in addition, rooms for spectrography, instruments, and special photographic development facilities.

The library serves the research staff. Other non-laboratory facilities in the new building include a conference room and offices for the staff which, too, has recently been enlarged.

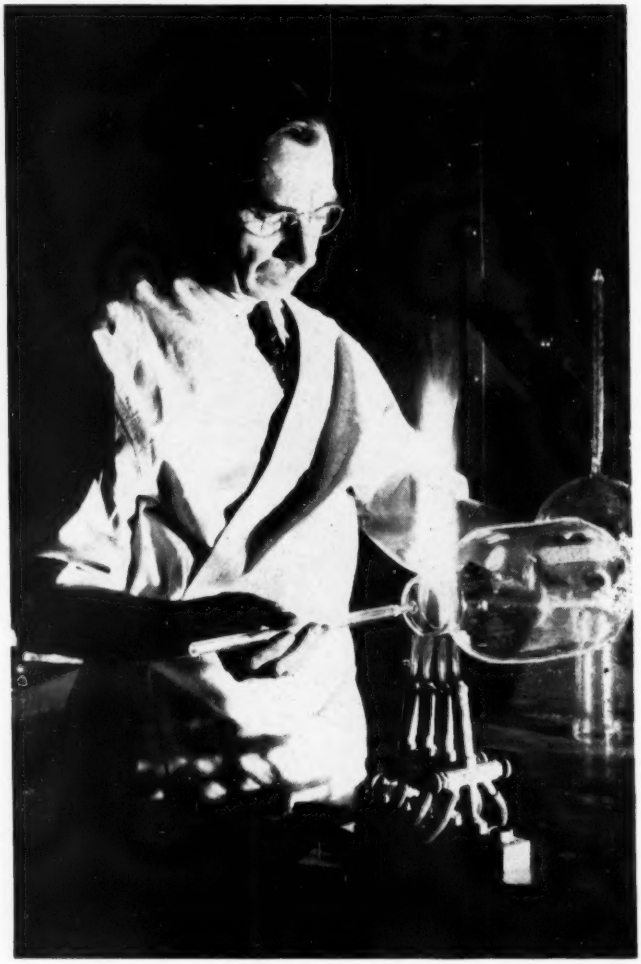


## Television Chemistry

With television rated as the fastest growing industry of the year, the chemistry of phosphors—the cathode tube coatings—is also moving to the fore. Pictured at left is the first step in the manufacture of a television tube. The operator pours a concentrated phosphor solution into a rotating funnel, whence it is ejected as a fine spray through small holes arranged circumferentially around the 24 inch, closed end, stem. This solution falls into a dispersing liquid, and is allowed to settle. After settling is complete the liquid is poured from the tube by means of the carefully-balanced, electrically-operated machine above.
Both pictures were taken at the Dobbs Ferry, N. Y. plant of North American Philips Co., Inc.

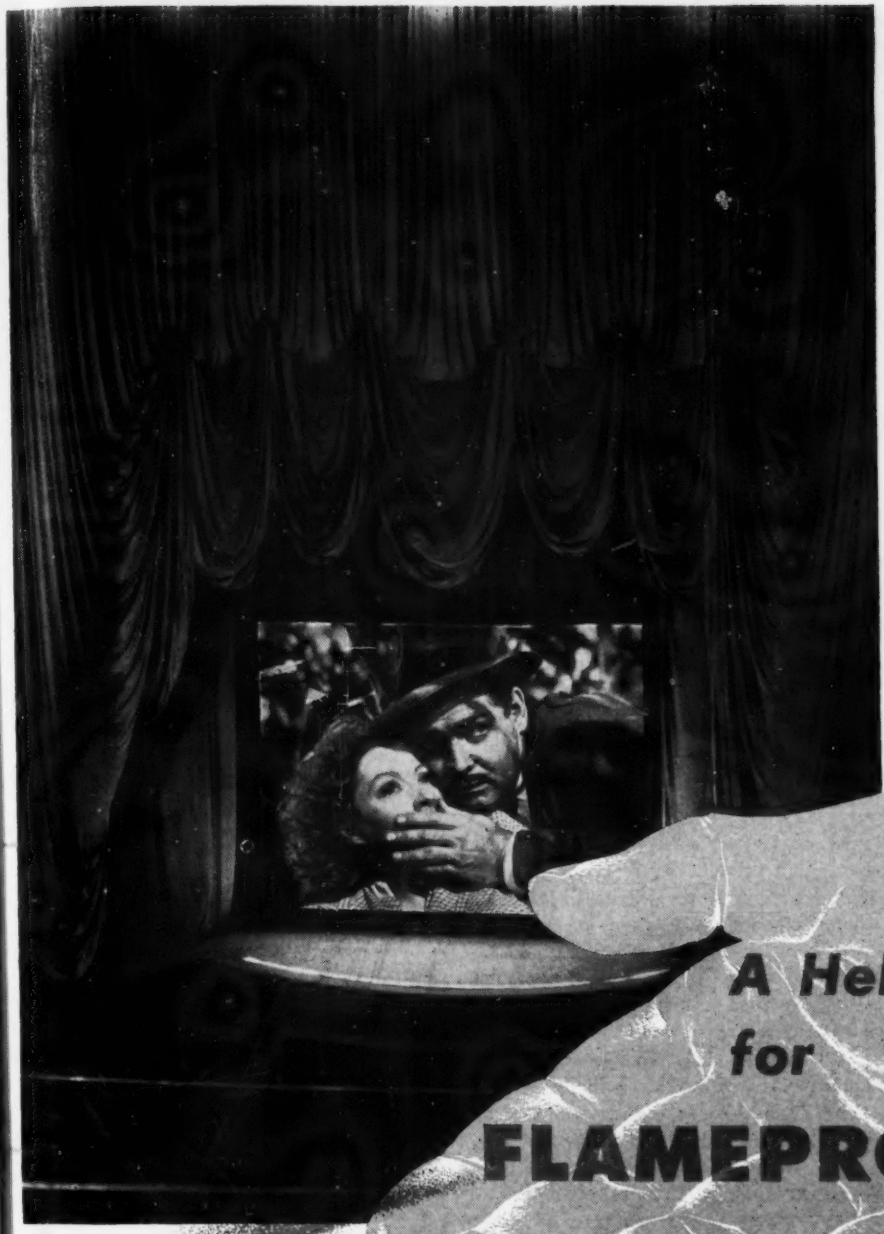
## Aerial Salesmen

Covering nine western states with a four-man sales force is what Gilbreath Chemical Co. manages to do by capitalizing on the speed and convenience of two company-owned planes. R. I. Gilbreath, shown (left) with salesman Hugh Harlan, emphasizes that without the planes his company could not work the territory without additional salesmen and without boosting costs.



## Flask of the Future

Microfilmed documents and rare materials will be preserved until the year 2004 in the flask fashioned recently at the Westinghouse Research Laboratories, Bloomfield, N. J. Two of the hard-glass flasks will remain in the cornerstone crypt of the new addition which the Advertising Club of New York is building.



The flameproofing of draperies, scenery, drop curtains and decorations in theaters, hotels, and other such public buildings is one of the major contributions made by the chemical industry for safer living. Today, phosphate of ammonia is generally recognized as the most effective flameproofing agent. Victor* Ammonium Phosphate is used extensively in industry for flameproofing textiles, paper, timber, and wood.

# A Helping Hand for FLAMEPROOFING

for 50 years
**VICTOR**
**CHEMICALS**
*for everyday Living*

*TRADE MARK

*Victor chemicals used in flameproofing include:*

**Diammonium Phosphate** . . . pH of 1% solution 8.0.

**Monoammonium Phosphate** . . . pH of 1% solution 4.5.

**Fyrex** . . . a neutral crystalline ammonium phosphate.

**Flexible Fyrex** . . . also a neutral product to which softening agents have been added to prevent treated materials from adhering to drying rolls, plates, or forms, and to preserve flexibility.

**Special Flexible Fyrex** . . . provides rapid penetration because of added wetting agents and preserves flexibility by inhibiting the growth of large crystals on drying.

**VICTOR CHEMICAL WORKS,** 141 West Jackson Boulevard, Chicago 4, Illinois

# NEW PRODUCTS & PROCESSES

### *Diamyl Phenols* NP 586

Diamyl phenols are now available from the Chemical Division of Koppers Company, Inc. This is the first of a series of alkylated aromatic compounds which are scheduled for production.

The diamyl phenols are a mixture of the isomers of the diamylated phenols. The amyl substituents include both secondary amyl and tertiary amyl groups attached mainly in the 2,4-positions. This material is an oily, light straw-colored liquid which is miscible with both aliphatic and aromatic hydrocarbons, and is essentially insoluble in water and in 10% aqueous solutions of alkali hydroxides.

Although insoluble in dilute aqueous alkalis, the phenolic hydroxyl group will undergo such typical reactions as acetylation and reaction with ethylene oxide. Oily condensation products are also formed by reaction with formaldehyde.

The product is suggested for use in the production of lubricating oil additives, modified phenolic resins, synthetic detergents, plasticizers, rubber chemicals, and pharmaceuticals.

### *Ethylene Urea Process* NP 587

A new synthesis of ethylene urea will be of use in the chemical, textile, leather, pharmaceutical, plastic, paint and adhesive industries.

The new process involves conversion of a mixture of ethylene diamine and carbon dioxide, or of the addition compound ethylene diamine carbonate, to ethylene urea under the influence of heat and pressure. The synthesis is simple, easy to control and involves no expensive equipment. Yields of 95 yield per cent or better may be obtained. The cost approximates that of the raw material ethylene diamine. Patent application has been filed by Evans Research and Development Corp.

Uses include manufacture of condensation polymers with polyhydroxy compounds useful as finish agents for textiles and leather, and alkoxymethyl derivatives for creaseproofing and waterproofing textiles.

### *Acetone Cyanohydrin* NP 588

Acetone cyanohydrin, produced for many years as an intermediate in the manufacture of methyl methacrylate, is now commercially available for the first time from Rohm & Haas Co.

It is expected that acetone cyanohydrin (α-hydroxyisobutyronitrile) will be of value to the chemical industry as an intermediate for synthesis. It contains two functional groups, a tertiary hydroxyl and a nitrile. These reactions include hydrogenation of the nitrile to give an amino alcohol, acetylation of the hydroxyl, replacement of the hydroxyl with $PCl_5$ to give α-chloroisobutyronitrile, and hydrolysis of the nitrile to produce α-hydroxyisobutyric acid.

Good yields of α-aminoisobutyronitrile and its N-substituted derivatives are obtained by reaction of acetone cyanohydrin with ammonia and with primary and secondary amines. The amino nitriles may be reduced to diamines or hydrolyzed to amino acids. The reaction of acetone cyanohydrin with ammonium carbonate gives a nearly quantitative yield of 5,5-dimethylhydantoin, which is readily hydrolyzed to α-aminoisobutyric acid.

Simultaneous hydrolysis and dehydration of acetone cyanohydrin leads to methacrylamide sulfate in good yields.

Another type of reaction is illustrated by the reported preparation of α,α-dimethylsuccinic acid by condensation of ethyl cyanoacetate and acetone cyanohydrin in the presence of sodium ethoxide, followed by hydrolysis of the intermediate dinitrile.

### *Tetraethyl Pyrophosphate Insecticide* NP 589

A new insecticide, three times as powerful as its German predecessor, but no more expensive, is now being produced in commercial quantities by Monsanto Chemical Company. To be known as Nifos-T, the chemical contains 40 per cent tetraethyl pyrophosphate. It is unusually effective against aphids, mites, and certain crop pests difficult or impossible to control otherwise.

About one-fifth of the $500,000,000 lost to insects each year consists of truck and garden crops which are attacked by mites and aphids. Entomologists explain that heretofore the mites and aphids multiplied abnormally with the extinction by DDT of their natural insect enemies, thus making the aphid and mite control problem more pressing where DDT was used.

Because Nifos-T will decompose to relatively non-poisonous residue within a few days after use, vegetables and fruits treated with it need not be washed before marketing. And since it will sell for the same price as the earlier Nifos, which is one-third as powerful, growers will get three times the activity at no extra cost.

### *2-Methyl Furan* NP 590

2-Methyl furan or Sylvan, as it is called by the Electrochemical Department of E. I. du Pont de Nemours & Co., Inc., the manufacturers, is a cyclic diene possessing ether-like properties. It may be utilized as a chemical intermediate, since a variety of reactions are possible.

It can be reduced to 2-methyl tetrahydrofuran. Hydrolysis and acetalization cause fissure of the ring. 2-Methyl furan can be converted to other heterocyclic compounds by reaction with ammonia, amines, and hydrogen sulfide. Alpha, beta-unsaturated aldehydes and ketones react by a substituting addition. The diene syntheses and Mannich reaction produce condensation. Strong acids and alaklies cause polymerization. Other possible uses for this new product are as a synthetic resin ingredient and as a solvent.

Some physical properties of 2-methyl furan are as follows: appearance, colorless, mobile liquid; odor, ether-like; molecular weight, 82.098; boiling point, 62-64° C. at 760 mm.; specific gravity,


CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

**CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (1-8)**

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

| | | | |
|---|---|---|---|
| NP 586 | NP 590 | NP 595 | NP 600 |
| NP 587 | NP 591 | NP 596 | NP 601 |
| NP 588 | NP 592 | NP 597 | NP 602 |
| NP 589 | NP 593 | NP 598 | NP 603 |
| | NP 594 | NP 599 | NP 604 |

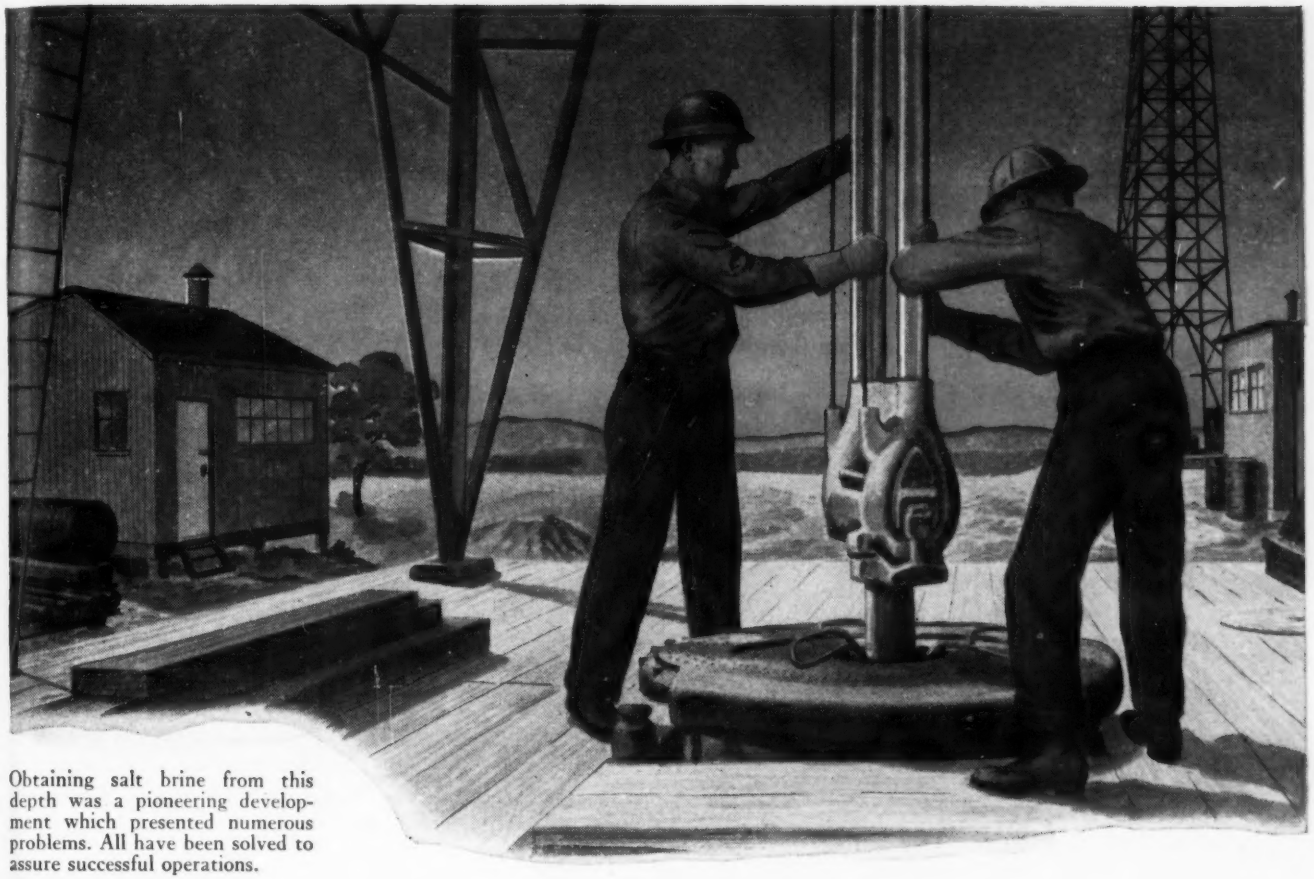
*(Please print)*

Name ..... (Position) .....

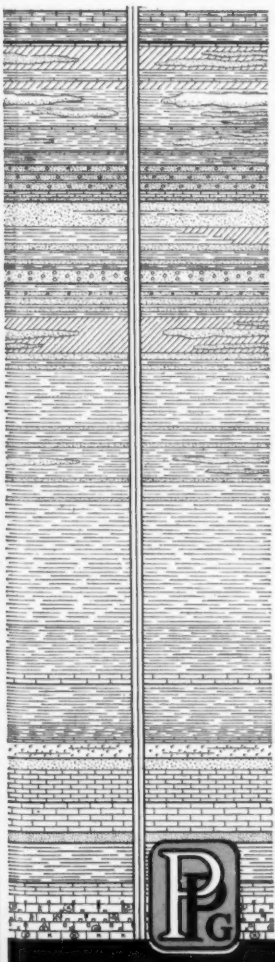
Company .....

Street .....

City..... Zone..... State.....



Obtaining salt brine from this depth was a pioneering development which presented numerous problems. All have been solved to assure successful operations.



# Chlorine and Caustic Soda

## *from the world's deepest salt wells*

The deepest salt bed in commercial use—6,800 feet below the earth's surface—provides the brine used at Columbia's electrolytic chlorine-caustic soda plant at Natrium, West Virginia. Hot water, pumped down to this great stratum, dissolves the rock salt and forces the brine to the surface.

The favorable location of the Natrium plant was established as a result of pre-Pearl Harbor studies by Columbia. Built and operated for the DPC, its post-war purchase by Columbia assured continued operation so helpful in meeting the urgent needs of industry for caustic and chlorine. The caustic soda is purified by a patented Columbia process to meet exacting uses such as required in the manufacture of rayon.

Pittsburgh Plate Glass Company, Columbia Chemical Division, Pittsburgh 13, Pa. District Offices: Chicago, Boston, St. Louis, Pittsburgh, New York, Cincinnati, Cleveland, Minneapolis, Philadelphia, Charlotte, San Francisco.

**COLUMBIA CHEMICALS**

**PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS**

**PITTSBURGH PLATE GLASS COMPANY**

# UTILIZATION OF ANSUL $CH_3Cl$

**These examples illustrate a few specific applications for Ansul Methyl Chloride in research laboratory and industrial practices:**

GRIGNARD . . . . . $CH_3Cl + Mg \rightarrow$

QUATERNARIES . . . . $CH_3Cl + RNH$

ALIPHATIC ETHERS . $CH_3Cl + Na$

AROMATIC ETHERS . $CH_3Cl +$

ALIPHATIC HYDROCARBONS . . . $CH_3Cl + R$

AROMATIC HYDROCARBONS . . . $CH_3Cl +$

" " . . . $CH_3Cl$

SILICONES . . . . . $SiCl_4 + 2CH_3MgCl \rightarrow (CH_3)_2SiCl_2 + 2MgCl_2$

**GRIGNARD**

$CH_3Cl + Mg \xrightarrow[dry]{ether} CH_3MgCl$

YIELDS—Excellent, better than 90%.

REACTION—Proceeds smoothly, rapidly, and is easily controlled. Can be carried on at atmospheric pressure and slightly above room temperature.

APPARATUS—Simple and inexpensive.

ANSUL $CH_3Cl$—Now a low cost chemical due to greatly expanded production facilities.

MAGNESIUM—Readily available and now relatively inexpensive.

CONCLUSIONS—Excellent yield, smooth reaction, inexpensive methyl chloride and magnesium . . . make a Low Cost Grignard Reagent.

**In addition Ansul Liquid Methyl Chloride is being currently used as a low temperature solvent • propellent solvent • extractant • refrigerant • and in other laboratory and industrial processes.**

**Methyl Chloride is a low priced chemical available in tank cars and large and small cylinders.**

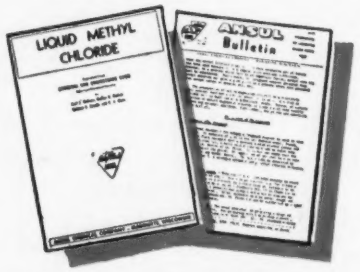
LIQUID Methyl Chloride ANSUL*

**PHYSICAL PROPERTIES**

| | |
|---|---|
| Chemical formula | $CH_3Cl$ |
| Molecular weight | 50.491 |
| Color (gas or liquid) | Colorless |
| Odor | Ethereal, non-irritating |
| Melting point | −144° F. (−97.6° C.) |
| Boiling point | −10.65° F. (−23.7° C.) |
| Critical Temperature | 289.6° F. (143.1° C.) |
| Critical pressure | 969.2 lbs. per sq. in. abs. |
| Solubility | Methyl chloride in water—3 to 4 volumes methyl chloride vapor in 1 volume of water at ordinary temperatures and atmospheric pressure—methyl chloride in alcohol—readily soluble. |
| Specific gravity of liquid | .909 |

*REG. U. S. PAT. OFF.

**Consult Ansul's research and technical departments on these and other applications of Methyl Chloride.**




**Write for treatise on Ansul Liquid Methyl Chloride and request bulletin describing the specific laboratory and industrial application in which you are interested.**

***For your* SULFUR DIOXIDE *applications . . . . Use* ANSUL SULFUR DIOXIDE**

**ANSUL CHEMICAL COMPANY**
INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WIS.
60 E. 42nd St., New York — 535 Chestnut St., Philadelphia


20° C./4° C., 0.915; solubility in water at 25° C., less than 0.3 gm./100 gm. water; solubility of water in 2-methyl furan at 25° C., less than 0.25 gm./100 gm. 2-methyl furan; and solubility in organic solvents, miscible in all proportions with methanol, ethanol, isopropanol, methyl acetate, ethyl acetate, butyl acetate, acetone, ethyl ether, n-heptane, petroleum ether, benzene, toluene, trichlorethylene, methylene chloride and tetrahydrofuran.

### *New Thiophenes* NP 591

Two new compounds, 2-aminothiophene (tin chloride double salt) and 2-acetamidothiophene which are derivatives of aminothiophene offer a practical starting point for research into the thiophene analogs of many dyes, drugs, and photographic chemicals.

Both the products are quite stable, fine, tin crystals and practically odorless. They are available from Arapahoe Chemicals, Inc.

2-Aminothiophene has a molecular weight of 531.22 and melting point 222-224° C. Cost is approximately $7.00 for 50 g. 2-Acetamidothiophene has a molecular weight of 141.19 and melting point 158-160° C. Cost is approximately $7.00 for 10 g.

### *Silica Powder* NP 592

Silica powder of high purity and submicroscopic fineness is now being produced in pilot plant quantities by The Linde Air Products Co., unit of Union Carbide and Carbon Corp. Preliminary investigations indicate that this powder may reveal new and effective applications in paints, lacquers, rubbers, elastomers, textiles, and lighting.

Control analyses show a minimum of 99.9 per cent $SiO_2$ content on a dry basis, with an average particle size of 0.01 to 0.05 micron. In addition to its extremely high purity and fineness of particle, another distinct advantage is that it is available in powder form, therefore can be dispersed in either aqueous or organic liquids or incorporated as a dry powder.

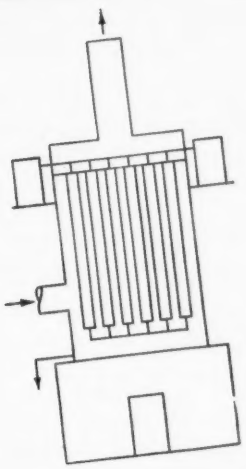
This silica powder, over a wide range of concentrations, has been found to disperse in, or to blend satisfactorily with, most organic or inorganic media (including water) and to remain in a stable homogeneous form indefinitely. Stable sols of high $SiO_2$ concentration, thixotropic or stable gels, dilatant liquids, and other colloidal systems can be formed. The extremely fine particles of silica give rise to surface phenomena which make it a suitable catalyst carrier in chemical processes.

On the basis of observations thus far, Linde silica powder can be employed as a pigment dispersant, extender or flatting agent in paints and lacquers, improving their brushing and protective properties,

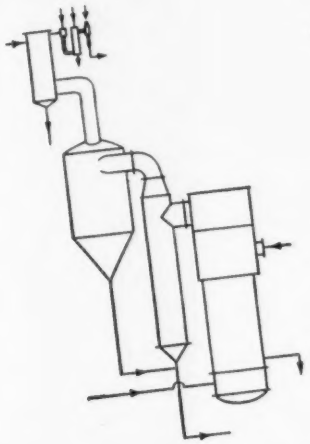
# STOP $H_2SO_4$ COLD!

## with Carbon . . . Graphite . . . and "KARBATE" Impervious Graphite!

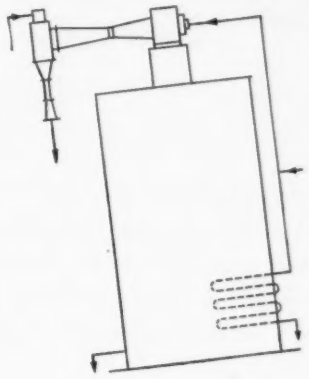
● "National" Carbon, Graphite, and "Karbate" Impervious Graphite are the most efficient materials for handling sulphuric acid. Equipment made of these materials is resistant to chemical attack by sulphuric acid up to 96% concentration. Moreover, it is light in weight, machinable, and mechanically strong. It is resistant to thermal and mechanical shock. There is no metallic contamination of the product. Both Graphite and "Karbate" Impervious Graphite have the highest heat-transfer rate of any practical material used in handling corrosive substances.



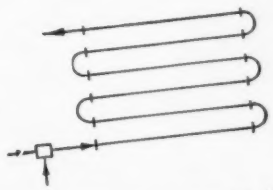
***Electrostatic Precipitators for Acid Mists*** — All corrosion eliminated with **carbon** housing, stack, tubes, beams, and grillage.



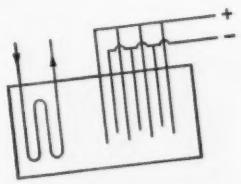
***Spin-Bath Evaporators*** — Improved heat-transfer rates and no metallic contamination with **"Karbate" Impervious Graphite** heating elements and auxiliary parts.



***Acid Concentrators*** — Spalling problems solved with carbon-lined bodies. Vapor piping, steam ejectors, and barometric condensers protected from erosion and corrosion by **carbon or graphite** linings.



***Acid-Dilution Equipment*** — 66 deg. Be. $H_2SO_4$ "cut" to any lower concentration quickly and economically with **"Karbate" Impervious Graphite** mixers, coolers, pumps, pipe, fittings, and valves.




***Plating-Solution Heat Exchangers*** — No metallic contamination with high-heat-transfer, corrosion-resistant **"Karbate" Impervious Graphite** exchangers.

*The terms "National" and "Karbate" are registered trade-marks of*

**NATIONAL CARBON COMPANY, INC.**

Unit of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

UCC

Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

Newark

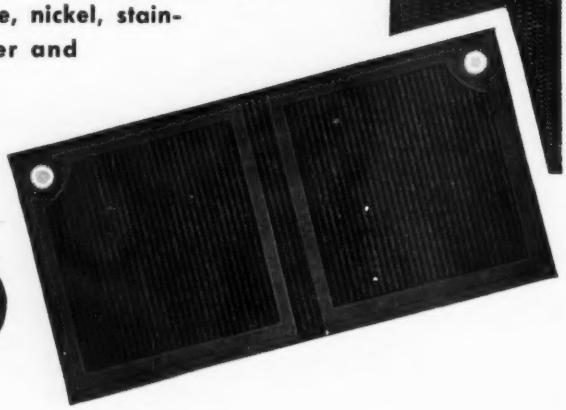
ACCURATE MESH

DURABLE WEAVE

METALLIC FILTER CLOTH

Newark metallic filter cloth is ideally suited for use in the process industries. It is woven firmly and uniformly with carefully selected and annealed wire and has the special Newark overlap weave for strength and exceptionally long service life.

Newark metallic filter cloth is available in the finest of meshes, in metals such as aluminum, brass, Monel, nichrome, nickel, stainless steel, gold, silver and platinum, in rolls or cut to fit your requirements.



NEWARK for ACCURACY

Newark Wire Cloth COMPANY

345 VERONA AVENUE • NEWARK 4, NEW JERSEY

but adding no color to the dried film. Reinforcing effects are possible in its application to specialty rubbers and elastomers, where any introduction of color would be undesirable.

In textile manufacturing, this fine silica can be used effectively in delustering fibers, increasing yarn strength, and accelerating spinning techniques. Experimental data have demonstrated the adaptability of the silica in producing high quality phosphors. Investigations now under way may lead to the use of high-purity fine silica powder in the role of a flatting or opacifying agent in plastics, as well as for reinforcement. At the present time, this new product is obtainable in 1, 5, and 10 pound lots; larger quantities can be furnished on advance notice.

### *Printing Ink Resin* NP 593

A new synthetic resin, designed specifically for use in printing inks, is now being commercially produced by Hercules Powder Co.

The resin, called Pentalyn 802-A Pale, enables production of overprint varnishes of improved initial color and reduced after-yellowing; and imparts better color in printing inks. It is designed to aid ink technologists to secure greater uniformity in ink vehicles based on phenolic-modified rosin esters.

Pentalyn 802-A Pale imparts a higher viscosity to linseed and China wood oil overprint and gloss ink vehicles, without sacrificing varnish stability or pigment reactivity. The new resin is produced in a color range significantly paler than that of other phenolic-modified rosin esters.

Pentalyn 802-A Pale is a phenolic-modified pentaerythritol ester of rosin and is the latest in the series of pentaerytritol resins developed by Hercules. It is one of the few synthetic resins developed specifically for use in printing inks.

### *Heavy Alloy* NP 594

Hevimet, an alloy of tungsten, copper and nickel, has been added to General Electric Company's line of metallurgical products. The alloy possesses a density 50 per cent greater than lead and is applicable to the design and construction of moving parts possessing maximum inertia and minimum size.

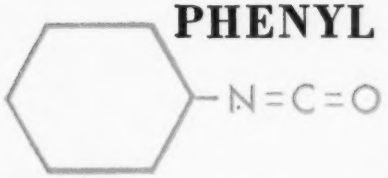
Originally developed in response to demands for a material of high density for use on a gamma ray screen, Hevimet is adaptable to the construction of balance weights for the elimination of vibration in crankshafts, modern air screws, centrifugal clutches and other rotating parts. Combining great tensile strength with good machinability, G-E Hevimet is highly resistant to atmospheric salt water corrosion and easily plated with cadmium, chromium and nickel. It can be silver soldered and brazed by standard methods.

A sintered material, it is made in a

# NEW CHEMICAL

## *Hooker Research Presents . . .*

## PHENYL ISOCYANATE (phenyl carbonimide)



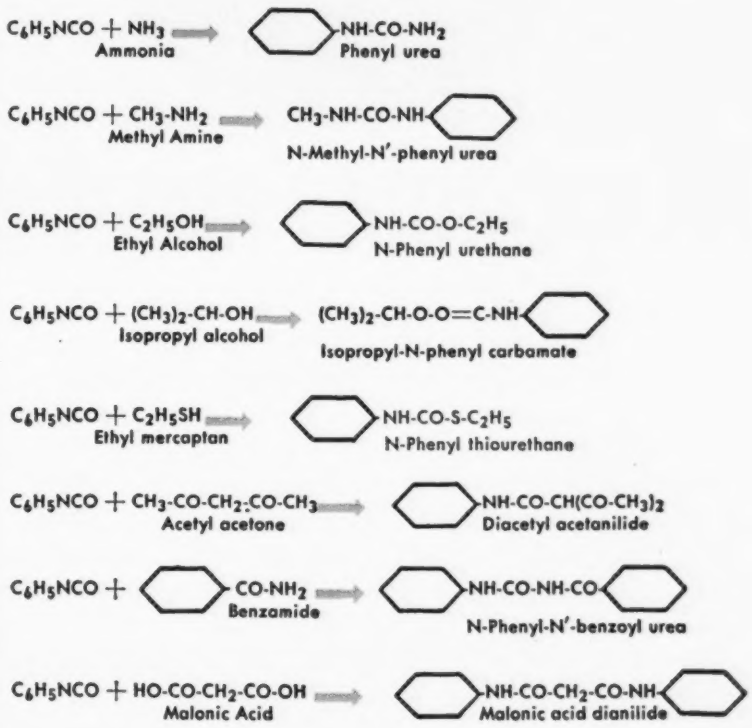

**DESCRIPTION:**
Phenyl Isocyanate is a pungent, lachrymatory, almost water white liquid.

**PHYSICAL DATA:**

| | |
|---|---|
| Empirical Formula | $C_6H_5NCO$ |
| Molecular Weight | 119.12 |
| Sp. Gravity, 15.5°/15.5°C | 1.101 |
| Refractive Index, n 20/D | 1.535 |
| Freezing Point | −33°C |
| Boiling Point | 162°C |
| Vapor Pressure, 100°C | 108 mm |
| Flash point (closed cup) | 63°C |

**SUGGESTED USES:**
As a versatile intermediate for chemical synthesis, it has many interesting possibilities in the manufacture of alkyd resins, textile finishing agents, herbicides and other as yet undiscovered products. Among the various classes of compounds that might be produced thru phenyl isocyanate are: other isocyanates, ureas, anilides, dianilides, urethanes, thiourethanes, carbamates, and thiocarbamates.

**SOME TYPICAL REACTIONS *of Phenyl Isocyanate***




For more technical information, write on your company letterhead for Data Sheet No. 372. Limited sample quantities of this product are available for experimental work.

**HOOKER ELECTROCHEMICAL COMPANY**

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• Barrett Anhydrous Ammonia is available in two grades: REFRIGERATION GRADE, guaranteed minimum 99.95% $NH_3$; and COMMERCIAL GRADE, guaranteed minimum 99.5% $NH_3$. Both grades are shipped in tank cars with a capacity of approximately 26 tons of $NH_3$. REFRIGERATION GRADE only is also packaged in 50, 100 and 150-pound standard-type cylinders and in 100 and 150-pound bottle-type cylinders.

Barrett Anhydrous Ammonia must pass rigid tests for moisture, non-condensable gases and other impurities, before release for shipment. Cylinders and tank cars are thoroughly cleaned and inspected, upon return to the plant, before reloading. Tank car shipments are made from Hopewell Virginia, and Southpoint, Ohio. Loaded cylinders are stocked at points conveniently located from coast to coast.

***The advice and help of Barrett technical service men are available to Barrett customers without charge. Free literature on Barrett Anhydrous Ammonia will be mailed on request.***

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variety of nonporous sheets and blocks. Complex shapes may be built up from simple pressing by a special process of hydrogen welding. The average product has a density from 16.8 to 17 grams per cu. cm., a tensile strength of 85,000 to 118,000 lbs. per sq. in., a Rockwell hardness of 30 to 40 "C" scale.

### *Commercial Hydroabietyl Alcohol* NP 595

A new product, hydroabietyl alcohol (CI, Dec., 1948, page 974), is the first commercially available primary alcohol to be developed from rosin, one of the cheapest organic acids available.

Hydroabietyl alcohol is a viscous liquid at room temperature. It is colorless, tacky, and not miscible with water, in contrast to more commonly used alcohols. Of all resin derivatives, it is the most resistant to discoloration and degradation by light or air.

The similarity of the properties of hydroabietyl alcohol to the properties of other high molecular weight alcohols, plus the fact that it is resinous in nature and low in cost, indicates a wide variety of industrial applications.

Like other high molecular weight primary alcohols it is subject to esterification with both organic and inorganic acids, and etherification. It is miscible with alcohols, ketones, esters, ethers, hydrocarbons, and chlorinated hydrocarbons, and is compatible with many film-formers and resins used in protective coatings and adhesives.

For many years the published research of laboratories both in America and Europe has disclosed a wide variety of valuable products that may be derived from hydroabietyl alcohol, such as resins, foamers, detergents, wetting agent, emulsifying agents, plasticizers, corrosion inhibitors, antioxidants, parasiticides, bactericides, and compounds highly stable to ultraviolet light. Full investigation of these compounds has awaited the commercial availability of this unique resin alcohol.

Hydroabietyl alcohol can be used without further chemical reaction as a modifier for chlorinated rubber, polyamides, hydrogenated oils, textile sizes, rubber compositions, and essential oil vehicles.

Commercial production of hydroabietyl alcohol is being carried out by Hercules Powder Co.

### *Electrolytic Wool Stripping Process* NP 596

A new process developed by the Interchemical Corp. for the stripping of color from dyed wool utilizes titanous sulfate. This product may be reduced by electrolytic means during the course of a strip.

Advantages of the procedure are threefold: A constant level of reducing

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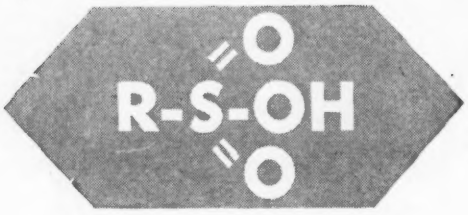


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- Metal processing

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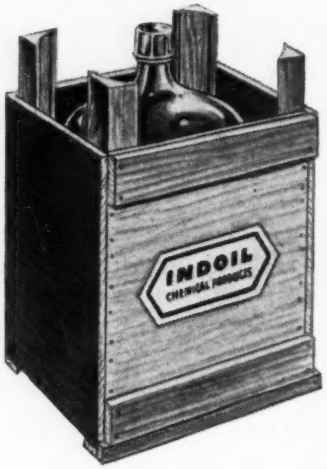


**METHANE SULFONIC ACID**
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power is maintained throughout the duration of the strip. Continuous reduction of the solution by electrolysis throughout the duration of the strip keeps the concentration of titanic sulfate and titanium dioxide at a minimum. The reagent may be continuously and repeatedly used, thus appreciably reducing cost.

### *Girard's "T" Reagent* NP 597

Girard's "T" Reagent is useful for the isolation or separation of keto-steroids from non-ketonic steroids. It is trimethylacethydrazidammonium chloride.

The molecular weight is 167.64 and the melting point is approximately 192° C.

This material is supplied in the form of white hygroscopic crystals, having little or no odor. Since the reagent is extremely hygroscopic, it should be protected from moisture and moist air. Even with careful handling it may be necessary, for precise work, to recrystallize old samples before use.

This reagent is supplied in standard amber wide-mouth, screw-cap bottles by Arapahoe Chemicals, Inc. Price $4.00 for 50 g.

### *Water Repellent For Masonry* NP 598

Rainchek is a colorless water repellent that penetrates into masonry — cement blocks, concrete, brick, tile, stucco— giving permanent protection against moisture and water. It will not evaporate or wash away from the treated surface.

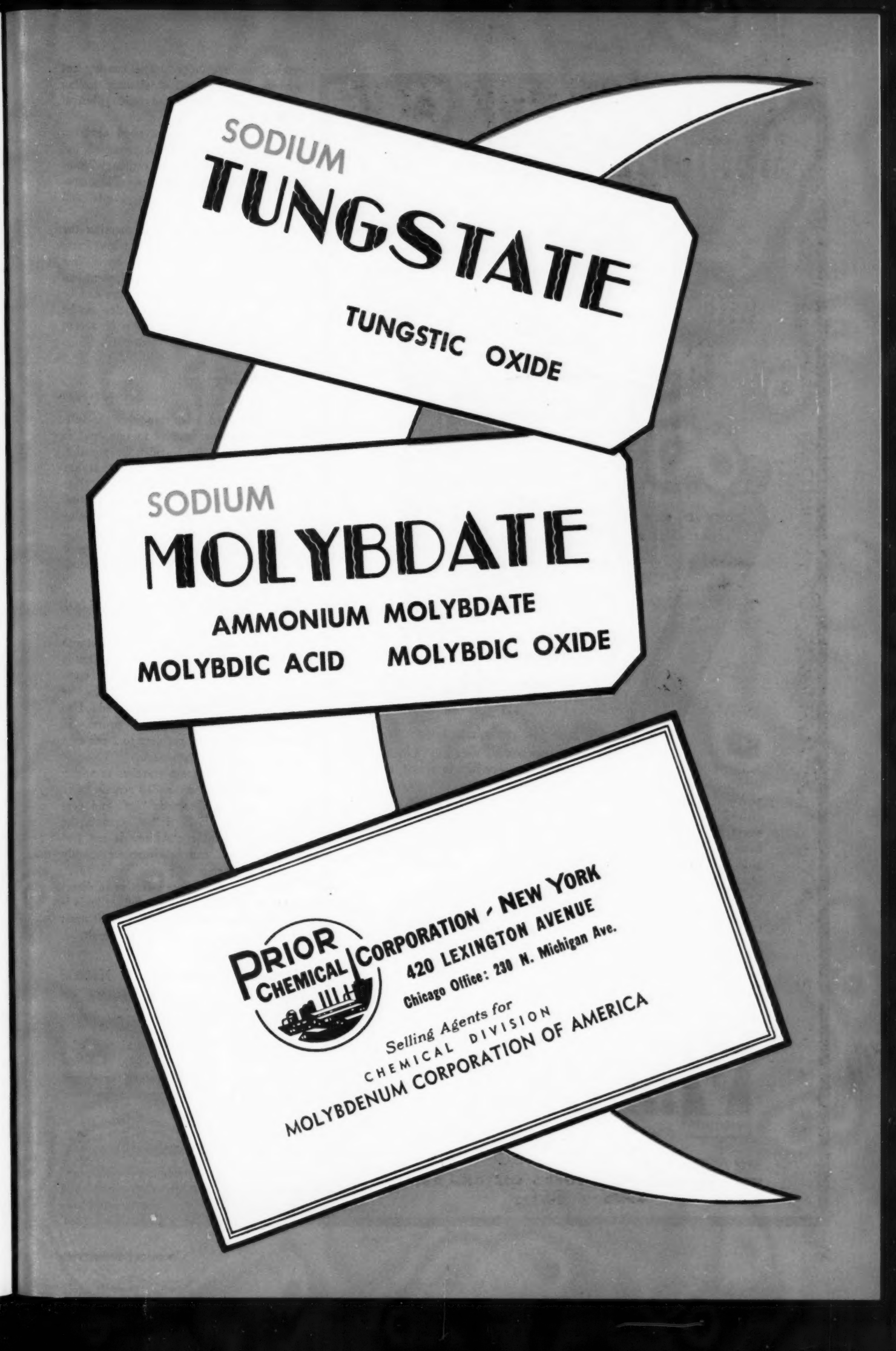
The manufacturer, Protection Products Mfg. Co., also claims that Rainchek controls dusting of cement floors by binding together the many tiny loose particles. The passage of moisture through masonry walls often leaves a deposit of alkaline salts on the surface causing large white stains. This efflorescence is controlled by the new product.

For all masonry surfaces, Rainchek's many uses include the treating of concrete silos, water tanks, boiler and elevator pits, pilings, garage floors, porch steps and other masonry construction.

### *Aluminum Anonizing Process* NP 599

A new process for the protection of aluminum surfaces without changing from the natural aluminum color which appears to be an improvement over the expensive anodizing technique and that of clear lacquering, which is not very adherent, is the anonizing process. Developed by the Technical Processes Division of Colonial Alloys Co., this is a simple immersion method which can be applied to aluminum that has been etched, polished, or left as milled, without noticeably changing the appearance.

Practically all of the alloys of aluminum respond to this treatment and most of them maintain or even improve their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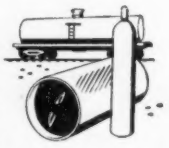

The collaboration of our Research Department is freely available in developing the application of "Virginia" $SO_2$ to your processes. Let's talk it over . . . at your plant or ours. VIRGINIA SMELTING COMPANY, West Norfolk, Virginia. *Established 1898.*

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original surface color. The coating resembles a clear glaze similar to an anodized coat (aluminum oxide) but it is more compact.

Anonized surfaces have good abrasion rsistance and are resistant to smudging, oxidizing, finger-marks, ordinary handling and high temperatures. They present an excellent base for paints and lacquers.

The process consists of immersing the cleaned aluminum into the hot anonizing solution for a few seconds to a few minutes, then rinsing. The equipment can be ordinary steel and many items can be handled in a batch. Many articles can be treated for as low as one-fifth of a cent per square foot of area processed.

### *Fast-Drying Coating* NP 600

Lacquer speed of drying plus the fullness of synthetic enamel in one coat is claimed by the Hilo Varnish Corporation for a new coating called "Clix." It has good gloss and resists fruit acids, vinegar, grease, alkali and mineral spirits.

Clix dries to handle in 5 to 10 minutes and hard enough to pack in from 1 to 2 hours. Available in white and colors, it is well suited for use on wood or metal.

### *Starch Stabilizer* NP 601

Development of an effective starch stabilizer for fluid or heavy paste starch solutions such as those used in textile processing and adhesives has been completed by Glyco Products Co., Inc. The new stabilizer, called Flovis, is added to the starch during the boiling process in amounts of from 0.5 per cent to 2 per cent of the weight of the starch.

Solutions made from starches to which the stabilizer has been added remain more fluid since Flovis retards "set" and prevents lumping. Even if "set" occurs, the effectiveness of the stabilizer is not lost since the "set" can be overcome readily by simple stirring.

Besides proving more effective in direct comparison with older materials, Flovis is also more economical since less of it must be used to achieve the desired result.

### *Curare Concentrate* NP 602

A pre-standardized, biologically assayed curare concentrate has been put on the market by the Transandino Co. Of special interest to the pharmaceutical industry this product is easily handled, readily available and offers ease and economy of terminal processing and ampouling.

### *Petroleum Plasticizer* NP 603

Rubber compounding, printing ink, caulking and potting compounds and floor tile are a few of the possible uses of a new high viscosity petroleum plas-

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YES, even textile manufacturers and dealers have come to us with problems relating to odor. They have had us scent some of their fabrics and de-scent others. Delicate materials have been made to seem even daintier and more attractive through the subtle use of odor. Imagine, for a moment, the enhanced appeal of a flowered print faintly perfumed with a fragrance suggestive of its floral motif! But the problem of rendering textiles more attractive is probably far removed from *your* present interests. Our point is simply, that if we can do this for the textile people . . .

# PERHAPS WE CAN DO IT FOR YOU!

For years, our laboratories have been engaged in the study and development of technical odor specialties for industrial application, and many of these are now being usefully applied in widely separated fields. It is quite possible, therefore, that we have the answer to your problem — whether it involve an appropriate fragrance for your product or the elimination of an unpleasant processing odor in your plant — right at our finger tips. If so, a letter explaining your problem will have our full and satisfactory response by return mail. Of course, you assume no obligation unless we can help you.

**FRITZSCHE** *Established* 1871 **Brothers, Inc.**

**PORT AUTHORITY BUILDING, 76 NINTH AVENUE, NEW YORK 11, N. Y.**

BRANCH OFFICES *and* *STOCKS: *Atlanta, Ga., *Boston, Mass., *Chicago, Ill., Cincinnati, Ohio, Cleveland, Ohio; Dallas, Texas, Detroit, Mich., *Los Angeles, Calif., Philadelphia, Pa., San Francisco, Calif., *St. Louis, Mo., *Toronto, Canada and *Mexico, D. F. FACTORIES: Clifton, N. J. and Seillans (Var), France.


tisizer developed by the Engineering Division of the Standard Oil Co. of New Jersey. Known as NUSO 250 this product is a dark clear liquid with aniline point of 120, specific gravity 0.989, and lbs./gal. of 8.24.

Other uses include miscellaneous wax compositions, rust preventives, waterproofing for canvas, paper lamination and impregnation, and tarring of rope and twine.

### *Peach Tree Borer Insecticide* NP 604

Fine Organics, Inc. has developed a white, crystalline insecticide for peach tree borer control which is being sold under the trade name of Peach-Klor and which is chemically a chlorinated hydrocarbon. The material sublimes and its application is similar to that of paradichlorobenzene. Its action, according to field tests, is also identical to that of paradichlorobenzene.

Peach-Klor is not only available in large quantities but is cheaper than paradichlorobenzene.

### *Aqueous Chlorination Of Phenol*

Chlorination of pure phenol is often attended by a serious difficulty; outlet pipes are often blocked as the result of sublimation of the phenol.

A new process which obviates this obstacle was recently described in *Chemistry and Industry* by chemists of the H. M. Research Establishment, Sutton Oak, St. Helens, Lancs. Here a 90 per cent solution of phenol in water is chlorinated very readily. The chlorination proceeds smoothly and the original homogeneous solution becomes an emulsion as the product is formed.

The process has been investigated on a small scale, but pilot plant-work is planned.

### *Rare Type Helium*

Working at temperatures more than 450° below zero, scientists at Ohio State University have succeeded in concentrating for the first time a rare form of helium by means of a single-step process.

The new helium is known as the "mass 3 isotope" of the substance, which exists normally in the proportion of only one part to a million of the normal "mass 4 isotope."

It is expected that the rare isotope will differ greatly from the more plentiful form of the element, especially in the liquid state, and that the investigation of mass 3 helium may throw light on the strange behavior of ordinary liquid helium.

At extremely low temperatures—within about two degrees of absolute zero—liquid helium takes on certain peculiar

*(Turn to page 112)*

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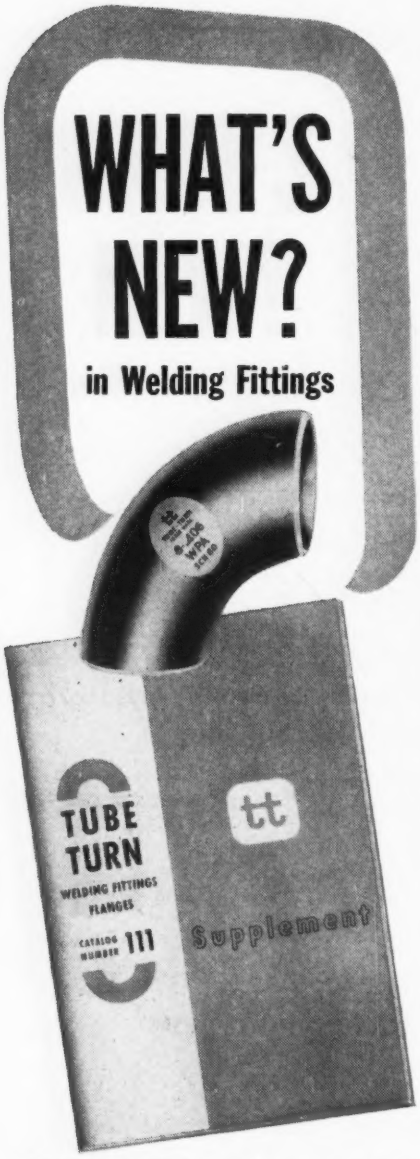


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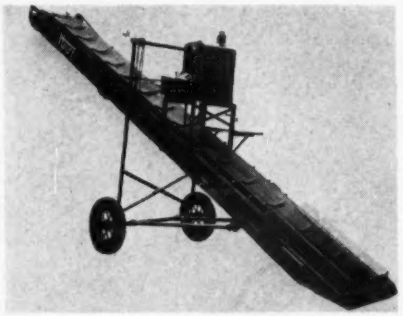
# NEW EQUIPMENT

## *Trough Conveyor* QB 409

The new portable trough conveyor of the Geo. Haiss Mfg. Co. is designed especially for the handling of all loose materials such as sand, gravel, chemicals, fertilizer, etc., from hopper bot-



tom cars to trucks or storage piles or from storage piles to trucks or bins.

It is built in standard belt widths of 16", 20" and 24", and standard lengths from 20' to 60' in multiples of 5'. Power is supplied by an electric motor or gasoline engine.

Capacity is from 60 to 180 tons per hour.

## *Condensate Return System* QB 410

Individual traps on steam operated equipment and shop lines are eliminated by a new condensate return system manufactured by the W. M. Acker Organization. This new equipment accumulates condensate by gravity and returns it to the boilers at temperatures ranging up to 350°F. The manufacturer states that all water fed to the boiler through the system is deaerated by effective liberation of oxygen and non-condensible gases.

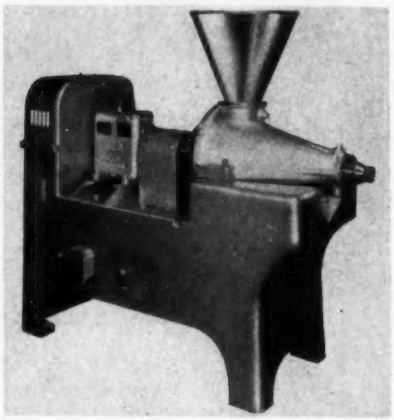
These systems are available for steam pressures up to 250 psi. and are manufactured in a range of sizes for boilers from 10 hp and up. Application can be made to handle condensate and make-up water in single and multiple for larger requirements. No pumps or other mechanisms are required for operation.

The manufacturer claims that increased efficiency in condensate return results in savings of 13 to 27% in fuel costs and increases production of steam-heated equipment up to 30%.

## *Continuous Mixer* QB 411

A new continuous mixer, called the Roto-Feed, is announced by Marco Co.

It will handle products ranging from the viscosity and density of bread dough



to liquids as fluid as water. Capacity can be varied from 5 to 1,000 gallons per hour.

## *Adjustable Blade Fans* QB 412

A new and complete line of "Axivane" adjustable-blade fans, Series 1000, is available from the Joy Mfg. Co. The Series 1000 consists of axial-flow fans of the vaneaxial type designed for a range of pressures up to 9.60 water gauge and volumes up to 100,000 cfm. "Axivane" fans are available in 124 different models, which incorporate various combinations of 15 different housing diameters (18" to 60"), 4 hub sizes, 16 motor-frame sizes, and 4 different speeds.

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**CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill.** **(1-8)**

Please send me more detailed information on the following new equipment:

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| | | | | QB 424 |

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For instance, variations of such questions as: How to get better closures, what is the best type of package for a particular job, how to save money in shipping, how to store and care for paper bags—these he takes in his stride. If necessary he comes right into your plant to seek out the answer.

This is a part of Bemis Packaging Service. It is available to all plants without obligation. Make use of it. Hundreds of companies save money right along because they've talked with the Bemis Packaging Specialist.

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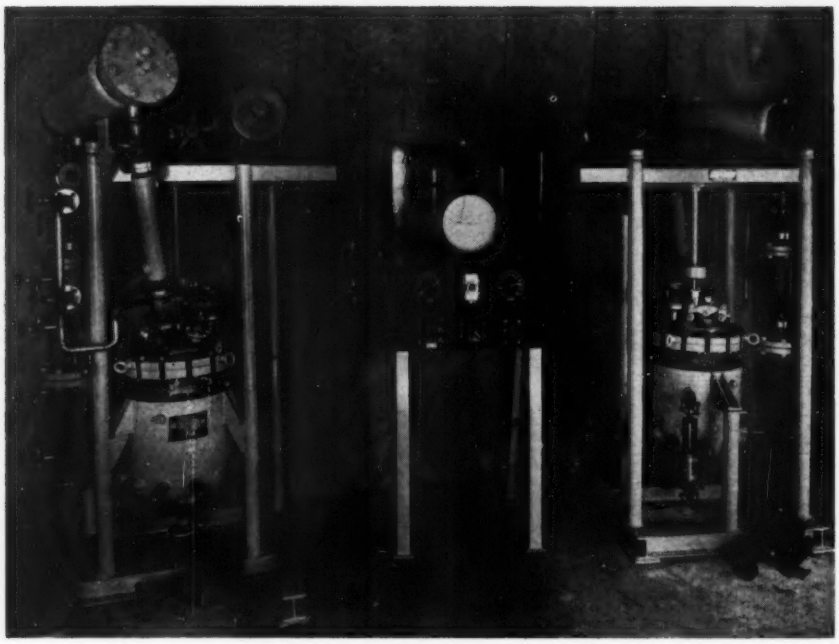


*Blaw-Knox electro-vapor pilot plant.*

### *Electro-Vapor Pilot Plant* QB 413

Blaw-Knox Co. has developed a 15 gal. electro-vapor pilot plant for use by manufacturers of resins, plastics, paints, varnishes and allied products, as well as by general chemical producers.

Included in the pilot plant are a 15 gal. kettle, vapor pipe, reflux and take-off condenser, condensate piping, condensate decanter, condensate receiver, steam jet ejector and auxiliary equipment including instrumentation. The design of these features has been arranged to provide facilities adapted for the investigation, development and evaluation of new processes. Particular attention has been paid to considerations of convenience and facility in maintenance and operation. Provision is made for ready replacement of those items which tend to deteriorate in service, such as valve packings, stuffing box packings, gaskets, etc.

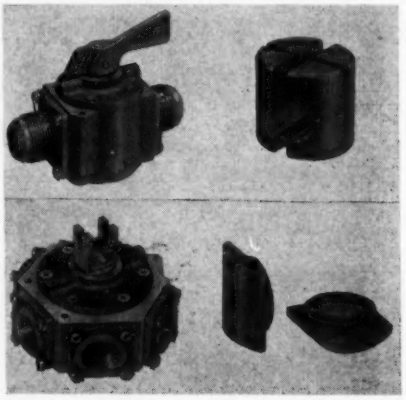
All materials of construction having contact with the charge, its vapors, or the condensate, are highly resistant to corrosion. The reaction vessel is designed for any pressure condition from full vacuum up to 150 psi.

Heat is applied to the vessel through the jacket, which is arranged for heating by the electro-vapor principle for high temperature reactions, or for use of steam up to 150 psi. for the low temperature reactions. The standard unit provides agitation at variable speeds, with a turbine rotor.

### *Non-Lubricated Shut-Off and Selector Valves* QB 414

A series of non-lubricated selector and shut-off valves for handling air, gases or hot liquids up to 400°F., and at non-shock pressures as high as 500 psi. are available from the Parker Appliances Co. in a variety of metals, and designated with non-lubricated rotors of inert graphite and are especially suited to the handling of corrosive fluids.

The shut-off valves are constructed around a cylindrical graphite rotor which has a central passage at right angles to the cylindrical axis. When the passage is lined up with the ports of the valve body, straight-through flow is permitted. Indexed 90°, blank surfaces of the cylinder wall face the ports. The rotor is in two parts, and contains four springs which exert a separating pressure at right angles to the passageway, to provide initial contact of the rotor parts against the valve body. The two-part rotor is then pressure-balanced, making the shut-off valves suitable for pressures up to 500 psi. Threaded port elements and shafts are fitted to the valve body containing the rotor with "O" ring seals.

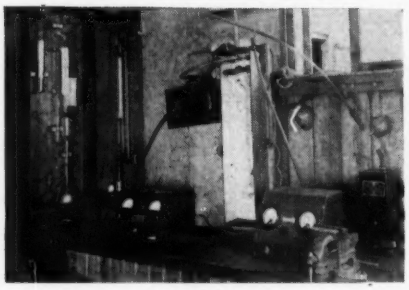


***Above: Shut-off valve type, with detail of graphite rotor construction.***

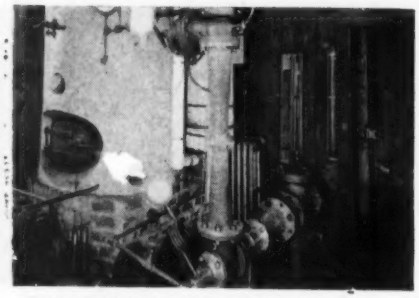
***Below: Selector valve type, showing the graphite rotor inserts with bonded rubber sacs which produce a "balanced" seal.***


# What's Behind a CR Evactor?

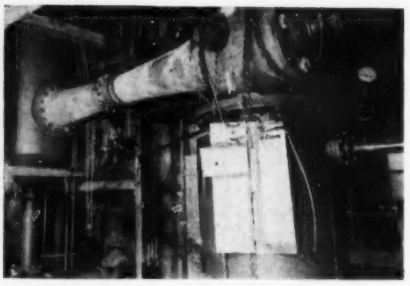
**The production of Evactors is no routine operation at the Croll-Reynolds plant. Although CR engineers have over thirty years of industrial vacuum experience to guide them, the Croll-Reynolds testing and development department is one of the important units of the company. Development work is constantly under way to improve the efficiency of Croll-Reynolds Evactors wherever it is possible. It is this never-ending research and development which give CR Evactors their exceptional efficiency.**



1. Instruments in the CR laboratory set up for measuring extremely high vacuum.



2. Special boiler in the CR pilot plant for providing unusual conditions of high pressure steam or superheat (or both) to duplicate the working conditions in customers plants.



3. A 30-inch CR Booster Evactor on test in a CR shop.

**CROLL-REYNOLDS CO.**

17 JOHN STREET, NEW YORK 7, N. Y.

CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

CROLL-REYNOLDS

# ARREST CORROSION

## with CHEMICAL STONEWARE

NITRATING KETTLE

The destructive hand of corrosion is never more active than in the reaction stage of your process. For dependable protection at this critical point, use nitrating, boiling and vacuum kettles made of General Ceramics Chemical Stoneware, equipment that is absolutely *corrosion proof* against all acids except hydrofluoric.

You get other important cost-saving plus values with Chemical Stoneware, too. It will stand up under a wide range of temperatures . . . its stone-hard surface cannot absorb contents, is easy to clean . . . it has high mechanical strength.

General Ceramics kettles are designed and built by chemical engineers – men who know your problems. For full details, write for Bulletin 171. If your process calls for unusual equipment, ask General Ceramics for the specific answer to your problem.

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**General Ceramics AND STEATITE CORP.**

**CHEMICAL EQUIPMENT DIVISION • KEASBEY, NEW JERSEY**

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**SAN FRANCISCO:** 598 Monadnock Bldg.
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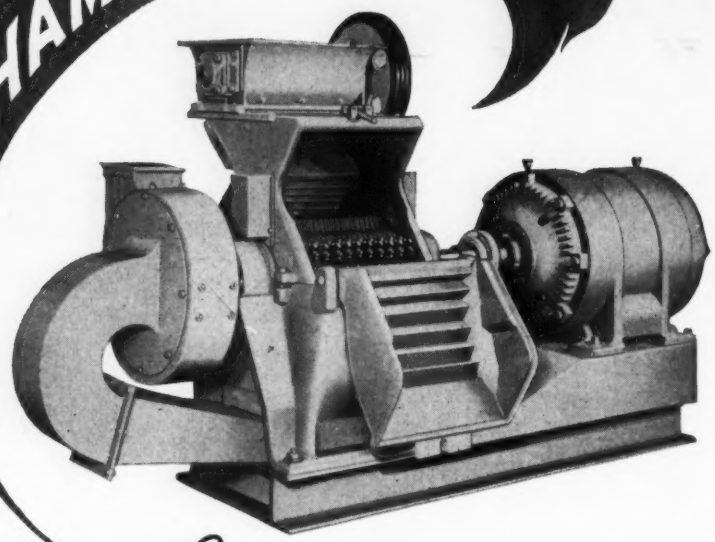
**In addition to the manufacturing facilities of the Chemical Equipment Division those of the Insulator Division are also available for handling ceramic problems in all branches of industry. General Ceramics & Steatite Corporation is therefore able to offer service covering all industrial applications of ceramic products.**

# SPROUT·WALDRON

## HAMMER MILLS



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★ TROUBLE-FREE OPERATION

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Ruggedly constructed and uniquely designed, Sprout-Waldron Hammer Mills offer outstanding efficiency on many processing applications. Exceptional operating economy is assured by the mill's overall simplicity.

Every square inch of blasting surface is fully utilized, realizing maximum capacity per horsepower. Sprout-Waldron and Company, Muncy, Pennsylvania.

SPROUT WALDRON
Manufacturing Engineers

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The selector valves come in a variety of rotor arrangements, permitting the inter-connection of various combinations of as many as five separate lines. An "all-off" position is provided as well.

The actual pressure in a line is utilized to help seal off the line when it is closed. This is accomplished by special graphite inserts fitted into a metallic rotor body at points corresponding to ports which must be sealed.

The graphite seals are ground to a radius corresponding to the rotor cavity in the valve body, and are free to move radially. Bonded to the inner side of the inserts are synthetic rubber sacs, which also contain a light spring. Thus as a sealing insert faces a port, the spring provides initial contact of the ground insert face with the valve body area around the port. A hole drilled through the graphite to the inner sac area admits line fluid to the flexible sac. The differential area of the port hole and the inner graphite surface results in additional sealing pressure forcing the insert against the port. This design is suited to all-non-shock pressures up to 50 psi.

For higher pressures spring loading only is used on the inserts.

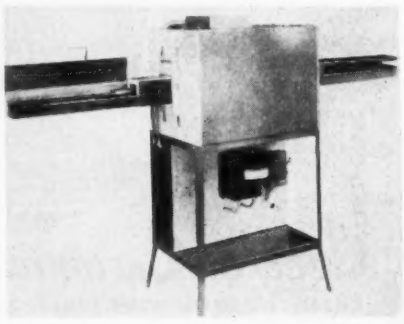
The shut-off valves range in size from ½" to 2" pipe size, and the selector series from ½"-1¼". All sizes can be furnished in aluminum, bronze, stainless or special alloy steels, and packings.

### *Safety Goggles* QB 415

The new Watchemoket #30 goggles fit over even the widest safety spectacles. The light weight frame is of molded plastic, and the shatterproof Impax lenses exceed Federal specifications for impact-resisting goggles. Frame or lenses can be replaced at low cost.

### *Batch Production Tunnel Kiln* QB 416

A new tunnel kiln recommended for small batch production work, firing of ceramic parts, and heat treating of small parts on a production basis is now avail-



able from the K. H. Huppert Co., Chicago. The electric heating element provides a maximum temperature of 2200°F.

The new kiln is the pusher type, with small refractory trays being pushed through the inside of the 33-inch firing chamber by means of a variable-speed

# PROBLEM IN *Flow Control?*

## . . . the answer is—

# POWELL *Valves*

Through the years of amazing growth and diversification of industry, problems in flow control have become increasingly numerous and more complex.

But in more than a century of specializing in making valves—and valves only—Powell has never failed to solve a problem as it has arisen.

Today there are Powell Valves—in Bronze, Iron, Steel and the widest range of corrosion-resistant metals and alloys ever used in making valves—to satisfy each and every known industrial flow control requirement. And, as a new problem presents itself, the answer will be—Powell Valves.

**Fig. 1845**—200-pound Nickel Swing Check Valve. Screwed-in cap and regrindable, renewable disc.

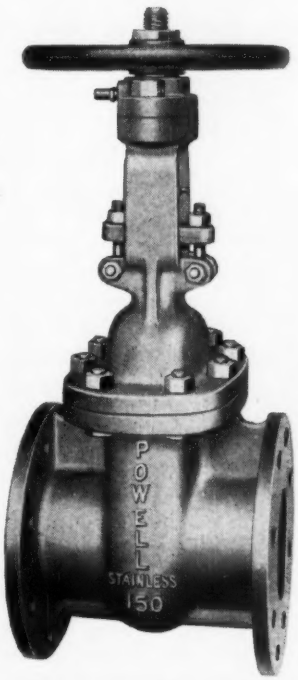



**Fig. 2453-G**—New, standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc.

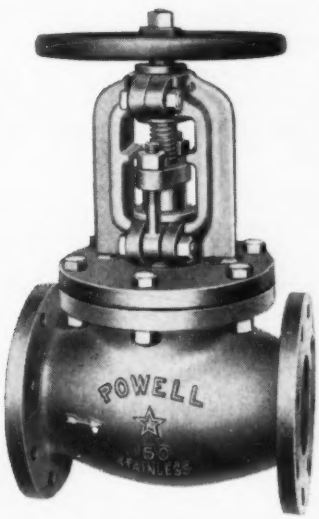



**Fig. 2429**—150-pound Stainless Steel Globe Valve with flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc.

Powell Flush Bottom Tank Valve. Available in two designs: **Fig. 2309**, in which disc rises into tank to open valve; **Fig. 2310** in which disc lowers into body of valve.

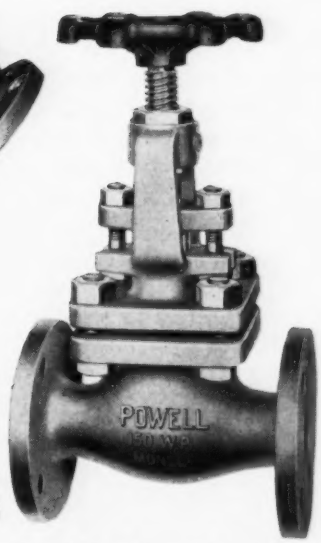



**Fig. 1969**—150-pound Monel Metal Gate Valve with flanged ends, bolted flanged yoke-bonnet, outside screw rising stem and taper wedge solid disc.

**The Wm. Powell Co., Cincinnati 22, Ohio**

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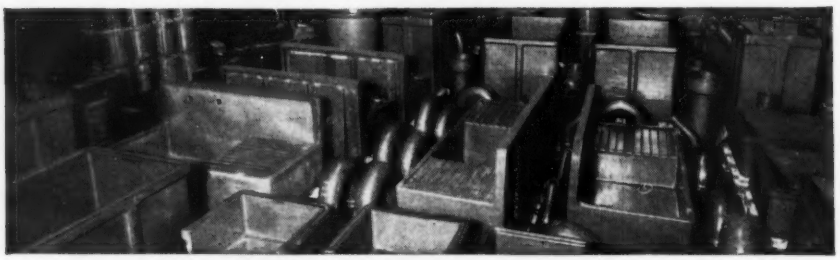
# POWELL VALVES

# When You Need *Corrosion-Proof Equipment*—

—You want equipment that is corrosion-proof not just on the surface but all the way through — that's KNIGHTWARE! These corrosion-proof ceramics result from selected raw materials, careful forming by master craftsmen and controlled processing backed by 40 years' experience. All KNIGHTWARE is of seamless, one-piece construction and will handle gases, all alkalies, and all acids except hydrofluoric acid and strong caustics.

These photos of our kilns give some idea of the many shapes of KNIGHTWARE produced. Pictured above, for instance, are 500 gallon jars, large kettles, roof ventilating caps, reducer pipe fittings, disc coolers and condensers. In the lower photo: lab. equipment including tanks, sinks, pipe and fittings. Other KNIGHTWARE products include towers, filters, rolls, sumps, coils and valves in both special and standard design.

Whatever your needs in chemical stoneware we can probably supply you. Write today for KNIGHTWARE literature. Please indicate type of equipment in which you are interested as well as service conditions involved.



KNIGHTWARE CHEMICAL EQUIPMENT

MAURICE A. KNIGHT
201 Kelly Ave., Akron 6, Ohio

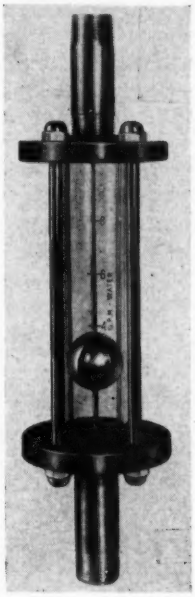
drive. The firing zone is actually 10 inches long, and the size of the tray is 2⅝" by 3¾". The pusher mechanism as well as provision for loading and unloading is self-contained.

The entire unit's weight is 700 pounds, and it comes completely equipped with a #221 Wheelco Capacitrol for automatic temperature control, fused switch box and step-down power transformer. The kiln operates on single phase, 110 or 220 volt AC.

### *Ball Flow Indicator* QB 417

The new ball flow indicator of the Schutte and Koerting Co. provides both a visual indication of flow and an approximate rate of flow.

The unit consists of a tapered glass tube with a moving, guided brass ball which acts as the flow indicator. Move-



ment of the ball is confined to the center of the tube by a slender stainless steel rod. Neoprene gaskets are used to seal the glass tube, allowing the indicator to be used with lubricating oils and many solvents.

The indicator is manufactured in all standard pipe sizes from ¼" to 2" for flow ranges from 0.2 gpm to 60 gpm.

### *Thickness Gage* QB 418

A new instrument for measuring corrosion and wall thickness from one side of metallic surfaces produced by the Scott Electroflux depends upon the fact that as a current is passed between two electrodes, attached to a metallic surface the potential difference varies with the plate thickness and the electrode spacing.

Elecrtoflux is designed for the non-destructive inspection and testing of metallic containers, vessels and piping while in service. It measures thickness within 3% of actual thickness.

In its practical form it combines a 4-electrode probe, a small 6-volt battery, an electronic voltmeter and power supply for

Another "PRECISION" First

# New "PRECISION" ISOTROPIC INCUBATOR

An important new tool for the research biologist and all laboratories working in incubation. Developed after years of research, the "Precision" Isotropic Incubator embodies exclusive improvements designed to give exacting temperature control, ease in operation and complete freedom from temperature variation. It is the only incubator ever built having all these features . . .

UNIFORM TEMPERATURE CONTROL . . . When both doors are closed, two louvres open automatically to create a circulation channel between the inner and outer door, giving forced air circulation on all six sides.

EXACT, 3-POSITION THERMOSTAT CONTROL... Assures temperature uniformity, within 0.350° C., in every part of the cabinet, even when fully loaded. Thus every specimen is exposed to the same temperature throughout incubation.

RAPID TEMPERATURE RECOVERY . . . After door has been opened, auxiliary heater and thermostat bring the incubator rapidly back to operating temperature. A unique "Precision"-Isotropic feature vitally important in incubations.

OPERATES BELOW ROOM TEMPERATURE . . . Built-in coil with automatic water level controller, permits operation below room temperature. Suitable for 32° C. incubation as recommended by the American Public Health Association.

ENTIRE MECHANISM EASY TO SERVICE...Simply release two bolts and pull out bottom drawer. Blower, heating elements, relays, electric wiring, cooling coil, motor, pilot lights and all controls are built into this single unit. Saves hours of time in servicing.

CONSTRUCTION: Interior working chamber of heavy gauge sheet aluminum 20x20x24" high. Exterior of rust-resistant steel, 3-coat aluminum bronze finish. Overall: 26"x24"x35". Write for detailed literature No. 335 U-

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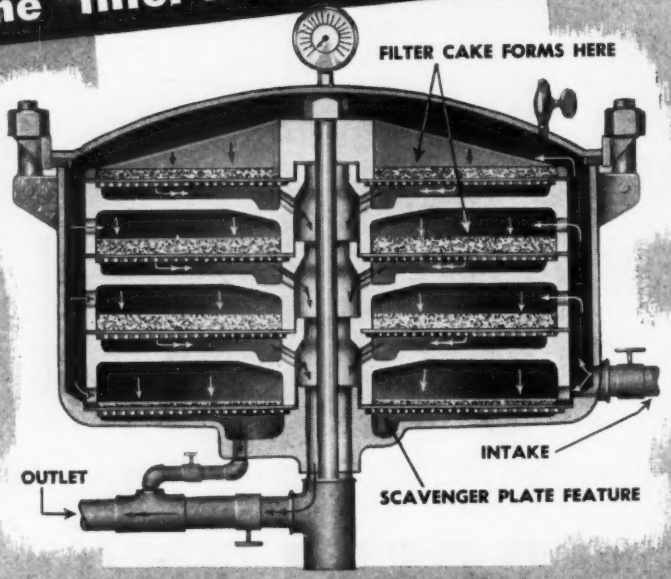
*Scientific Research and Production Control Equipment*

the *horizontal plate* principle

makes SPARKLER

the "filter that filters all liquids"




SPARKLER

*horizontal plate*

FILTERS

*. . . here's the story:*

A FEW OF MANY PRODUCTS THAT CAN BE FILTERED WITH SPARKLERS

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Alkalis
Beverages
Candy scrap
Caustics
Chemicals
Cleaning fluids
Extracts
Flavors
Gums
Hydraulic fluids
Lubricants
Milk
Molasses
Oils
Pharmaceuticals
Plating solutions
Resins
Shellacs
Soap, liquid
Syrups
Varnishes
Water
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★ Sparkler Horizontal Plate Filters handle any liquid from heavy varnishes to light alcohols.

★ Equally efficient performance on intermittent or continuous operation, under a wide range of temperature, pressure and viscosity conditions.

★ Equally effective whether removing carbons and contact clays or clarifying and polishing with filter aids.

★ Patented Scavenger Plate permits *complete* batch filtration. (It's virtually an auxilliary filter with an independent control valve.)

★ Unexcelled filter cake stability — no slipping or breaking.

*. . . why?*

Because filter media are supported on a horizontal plane and filter aids floated into position uniformly; filtration takes place uniformly over entire filtering areas. Flow through filter is always *with* gravity.

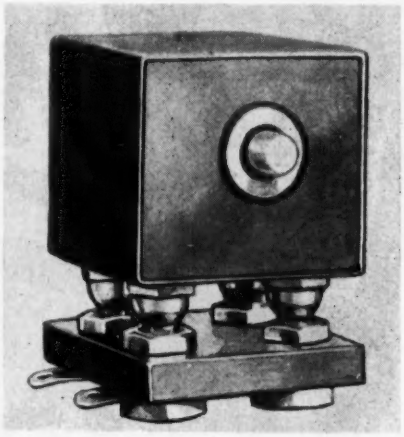
Sparkler Filtration Is *Engineered* Filtration—we invite correspondence on your problem. You will receive the advice of filtration scientists with a quarter of a century of experience in a specific field.

**SPARKLER MANUFACTURING COMPANY**
MUNDELEIN, ILLINOIS


measuring the low-voltage output from the probe, and inter-connecting cables to permit probe to be moved about at a distance from the metering equipment. Steel thickness from 0.125″ to 2.250″ can be measured. The device is portable and weighs 55 pounds.

### *Renewable Switch* QB 419

The new non-snap 101 renewable switch of Congress Fan and Electric Co. consists of four flexible beryllium strips ¼″ wide, each with a ¼″ diameter silver



contact at one end and attached to a banana pin at the other. The contacts stand normally 1/16″ apart. A Bakelite strip is fastened at right angles to a spring-pressed round brass rod in such a way as to push one set of contacts against the other with slight movement of the rod. Cleaning action is obtained by the flexing movement of the beryllium strips when the silver contacts are pushed one against the other.

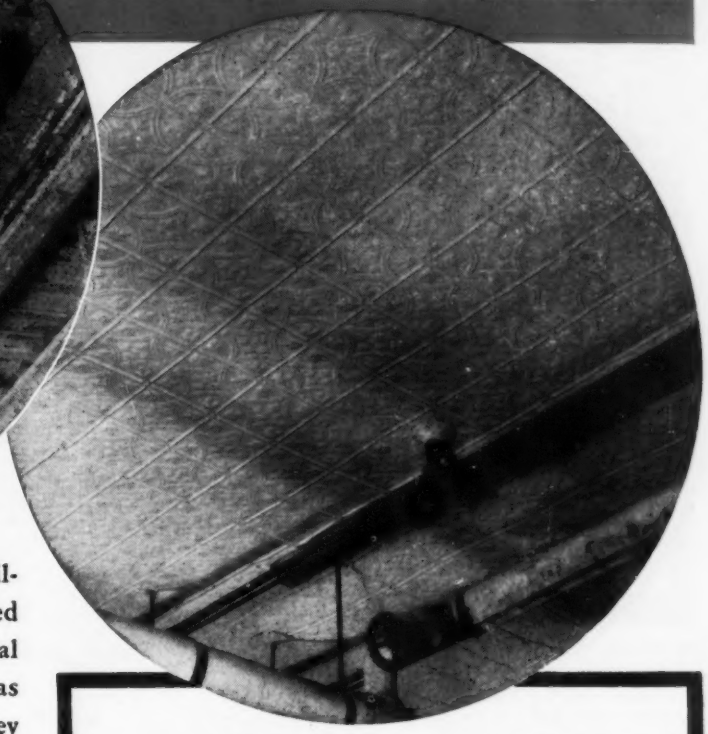
Each set of 2 contacts makes and breaks one side of the line. The 101 switch can be furnished normally open or normally closed. By breaking one side of the line only, the 101 can be used to make and break two circuits simultaneously or one before the other. It also can be furnished single pole double throw breaking both sides of the line and double pole double throw, breaking one side of each line. It is designed for 10 amps. at 110-125 volts AC.

### *Miscellaneous*

● QB420 The Automatic Transportation Co. has extended its line of Skylift *Lift Trucks* from the previously offered 2,000, 3,000 and 4,000 lb. capacities to 5,000, 6,000, 7,000 and 8,000 lb. capacities. The 5,000 and 6,000 lb. units have a collapsed height of 83″, lifting to 124″. The 7,000 and 8,000 lb. units lift to 115″.

● QB421 The *Heavy Duty Booster Fans* of the Chelsea Fan & Blower Co. are now available in five sizes. Fan shafts and motors are ball bearing mounted for smooth operation, long life and economy of operation. The fans are designed for

# *Do you buy* CORROSION PROTECTION BY THE GALLON? BY THE FOOT? OR BY THE YEAR?



THE photograph above shows two sections of a ceiling within 15′ of one another. The badly corroded area had been coated with one of the better industrial coatings. The one that looks as good as the day it was put on is coated with Tygon plastic Paint ... They both were exposed to the same conditions.

Frankly, you can buy "protective" coatings at a lower cost than Tygon; you can buy coatings that cover more feet per gallon. But you'll find it hard to buy real protection "by the year" at a cost anywhere near as low as you'll pay for Tygon protection.

For Tygon Paint doesn't chemically deteriorate with age; its tough, flexible, chemically-resistant film sets up a virtually impenetrable barrier against corrosion; stands up against the toughest conditions in your plant, month after month.

● *Write for a free test panel and the interesting new 16-page booklet "How to Use Tygon Paint for Longer Maintenance-Free Plant and Equipment Life."*

## TYGON PAINT

Tygon Paint is pure Tygon plastic in a solvent vehicle; applied cold by spray gun or brush; air dries quickly to form a tough, flexible, impact-resistant plastic film; resists most acids, alkalies, oils, water, alcohols; available in white, black, gray, green, red, aluminum and clear.

**U. S. STONEWARE**

*Akron 9, Ohio*

# Revolutionary performance!

## MORE VOLUME from a FRACTION of the SPACE at HALF the COST

**Four times as much production.**—The Morehouse Hy-R-Speed Mill has extremely high capacity. On most materials one unit can do the work of as many as four ordinary mills.

**Only 18" x 5'.**—Modern design and fine engineering make the Hy-R-Speed mill compact as well as efficient. It's only a fraction the size of old style equipment—can be moved easily and quickly.

**Save 50% on cost.**—Original cost is only 1/3 to ½ that of ordinary mills. Operating cost is even less. Very little attention is required during operation.

The Morehouse high speed principle makes these revolutionary mills possible. Advanced engineering design and nearly half a century of experience in manufacturing quality products contribute to smooth economical, dependable operation. Save money, save valuable space and improve both volume and quality with Morehouse HY-R-SPEED MILLS.

Write for complete details.

**MODEL SB 1400**

for non-corrosive materials

**MODEL SS 20**

in stainless steel for corrosive materials also available.

**Adjustable without stopping**
**Easy to clean or change over**
**No special training necessary**
**Replaceable parts**
**10 or 20 H.P. motor**

(3000-3600 R.P.M., 50/60 cycle, 220/440 volt AC, 3-phase, special types on request.)

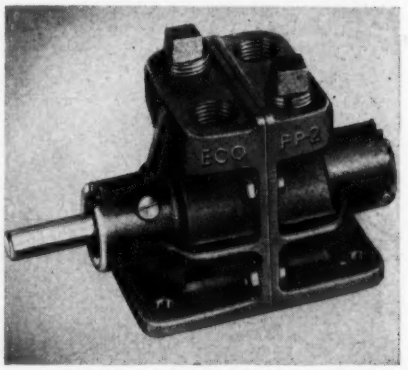
**MOREHOUSE INDUSTRIES**
**1156 San Fernando Rd. • Los Angeles 31, Calif.**


either vertical or horizontal operation. Blades are of non-ferrous metal. The five types included in the series are:

| *Code* | *Propeller Dia.* | *CFM* | *Motor* |
|---|---|---|---|
| DXB 16 | 16" | 2000 | ¼ HP |
| DXB 20 | 20" | 2500 | ¼ HP |
| DXB 24 | 24" | 4400 | ⅓ HP |
| DXB 30 | 30" | 7400 | ½ HP |
| DXB 36 | 36" | 9500 | ¾ HP |

● QB422 A new line of *Gearless Pumps* for general industrial use is now available from Eco Engineering Co.

The new pumps are smooth running with a new double impeller design which




gives a strong flow against pressure. Bodies are available in stainless steel, monel and bronze. Special impellers can be provided to suit the particular characteristics of the liquid being handled.

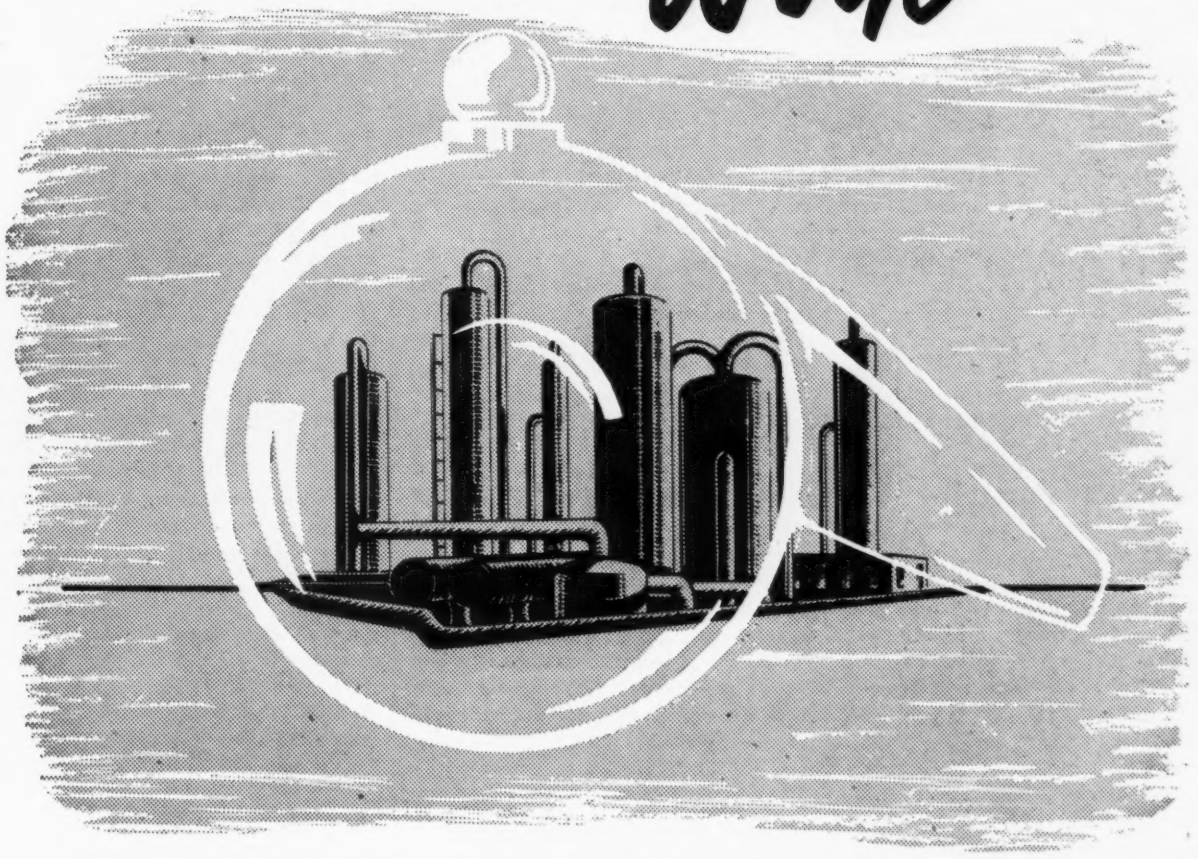
The new pumps are available in ¼" and ½" sizes with capacities from 1 to 12 gpm. and can be used against pressures up to 50 psi. at 200 to 3500 rpm.

● QB423 As the result of a newly developed butt welding technique, the Micro Metallic Corp. has found it possible to join together 6" x 18" unit sheets of *Porous Stainless Steel* to form large sheets of any required area. A modified form of "Heliarc" (inert gas shielded tungsten arc welding) is used. The new welding technique is particularly applicable in making up large sheets when the filter material is 0.100" or more thick. Many types of special shapes can be welded from 1/16" thick material. The welds are strong and ductile.

In addition to producing filter sheets of any area, the porous material can be welded to solid stainless steel members, such as enclosing rings, flanges, etc. The weld assembled sheets can be sheared, drilled and machined; within limitations they can be subjected to rolling and drawing operations; and they can be welded again after machining and forming.

● QB424 The new Fel-Pro "Hi-Temp" *Thread Compound* of the Felt Products Mfg. Co. is said to prevent freezing and galling of metal surfaces at temperatures as high as 1800° F. It was developed specifically for high temperature and high pressure applications, such as furnace tube header studs and plugs.

# ISCO CHEMICALS AT *Work*



# in CHEMICAL and ALLIED INDUSTRIES

THESE quality products which Isco has been supplying to industry for many years are still being shipped daily. We invite your inquiries.

Some of these commodities are available for prompt shipment; others only for future shipment. Let us know your requirements.

| | |
|---|---|
| Caustic Potash | Ortho Dichlorobenzene |
| Carbonate of Potash | Naphthalene |
| Bleaching Powder | Sodium Silicofluoride |
| Formic Acid | Carbon Tetrachloride |
| Irish Moss | Potassium Chlorate |
| Para Dichlorobenzene | Sodium Formate |

Manufacturers of creams requiring water-in-oil type bases should investigate our ISCO ABSORPTION BASES. A product of the Isco laboratories, these unusual bases are made entirely of chemically pure substances and are absolutely neutral. Among the outstanding features of Isco Absorption Bases are their ability to absorb up to five times their own weight of water and hold it in an emulsion. Powder base creams, all purpose creams, night creams, hair conditioning creams—all can be made easily and economically with Isco Absorption Bases.

Write, wire or phone for samples and complete information on any of these Isco products.

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## Innis, Speiden & Co.

A NAME AS OLD AS THE AMERICAN CHEMICAL INDUSTRY

# PACKAGING & SHIPPING

*by T. PAT CALLAHAN*

## *Fiber Drum Research To Cut Shipping Losses*

THE SHIPPING Container Institute, 475 Fifth Avenue, New York 17, N. Y., is investigating the causes for damage in shipping materials in fiber containers, with the goal of reducing loss and damage to packaged goods.

The initial nation-wide study, extending over 13 months, investigated the life-cycle of more than 700,000 fiber shipping containers. The need for and importance of this program is demonstrated by the amounts the railroads alone were forced to pay out in damage claims: $78,791,370 in 1945, rising to $94,300,672 in 1946.

These amounts are particularly disturbing in view of the fact that they represent sheer waste—avoidable with proper care and education—a loss like fire and weather damage, which is part of the eventual cost borne by the consumer and yet contributes no economic benefits to railroads or shippers. Extending from May, 1946, through July, 1947, the survey studied a total of 711,808 containers carried in 502 freight cars from coast to coast and border to border. Of these containers, 5,177 were reported damaged on arrival.

Early results of the Shipping Container Institute's study indicate that a major share of the responsibility for shipping damage must go to the shippers and their personnel. Findings bear out the opinion that faulty, careless loading practices are a main cause of damage. The most critical hazards appear to be rough handling during loading (especially dangerous to commodities in glass); excessive slack in the car due to failure to load tightly; weak or inadequate bracing; and nails, wires, straps and boards left in the car from previous use and not removed before loading—all causes under the shippers' control.

The carriers also appear to be responsible for an important share of the hazards resulting in the high rate of shipping damage. Rough handling, leaky freight cars, broken floors, floor-racks and car walls appear to be the greatest damage causes under the railroads' control. The study indicated that most of the damage occurred in freight cars in bad condition, the least damage in freight cars in good condition.

Shipping box manufacturers expect that they themselves will also be able to contribute to the reduction of loss and damage through scientific advances in fiber board manufacture and box construction. As part of the Shipping Container Institute's program, studies are being carried out by the Institute of Paper Chemistry in Appleton, Wisconsin, testing different fiber box materials and constructions. The recently completed Container Section of this Institute possesses excellent facilities and personnel for conducting this work in a $150,000 laboratory.

The study of the life-cycle of shipping containers is the first step in the Shipping Container Institute's program of fundamental research in the field of fiber shipping containers.

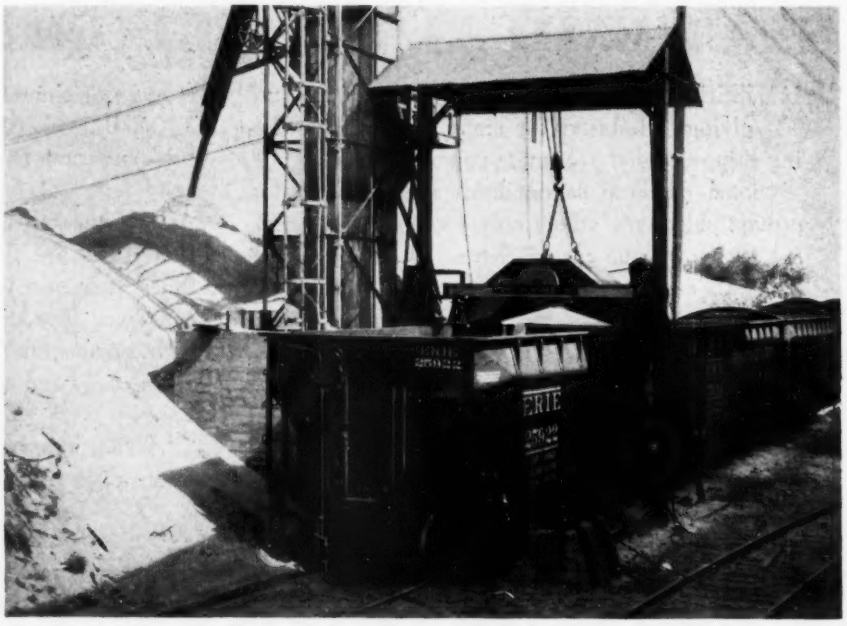
The Shipping Container Institute was founded by a group of fiber box manufacturers to provide technical information to the fiber industry, and to conduct fundamental research. The Institute concerns itself with all aspects of the shipping container, from point of production through final destination.

It is expected that the studies now being completed will show early results in improved shipping methods and lower claims for damage. The Institute's testing program will make possible better containers, both through its research and its educational campaign to develop sound shipping practices. Three major benefits are expected to accrue to shippers as a result of these efforts: (1) better carloading methods, (2) improved freight equipment, and (3) containers of improved construction.

The Shipping Container Institute is about to release complete results of this nation-wide study of shipping practices, which will include an over-all report on the study's results, with detailed facts and figures; detailed studies of the results as they apply to specific commodities, including paper items, metal items, commodities in cans, commodities in glass, beverages in bottles, tobacco, candy and cereal; recommendations on how to eliminate these shipping hazards by avoiding specific dangerous practices, improving others; photographs of improper loading methods and their results in damage; photographs of correct loading practices; and additional articles dealing with particular perspectives of the problem of shipping damage to fiber containers.

The tremendous increase in the use of fiber packages for the shipment of chemicals makes this survey by the Shipping Container Institute of particular

### *Unloading Bulk Chemicals*




***The new Robins car shakeout, a portable electric-powered materials-handling machine that empties hopper-bottom railroad cars rapidly so that entire trainloads can be unloaded quickly without uncoupling the locomotive, is shown in action at the Rossford plant of Libbey-Owens-Ford Glass Co. Designed and built by Robins Conveyors Division, Hewitt-Robins Inc., Passaic, N. J., the car shakeout shakes free-flowing bulk materials out of tightly packed cars without damage to the cars, or danger to workmen.***

# from SUGAR to SAND

## ST. REGIS PACKAGING SYSTEMS PROVE

# BETTER · FASTER · CHEAPER

Case History No. 16 — Multiwalls are filled and weighed by 105-FV packers.

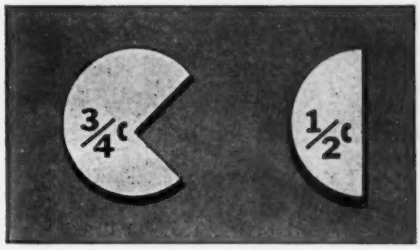
Case History No. 17—Multiwalls lend themselves to mechanical handling methods.

## CASE HISTORIES TELL THE STORY

Five recent case histories—factual reports by manufacturers of five different products—give the details of better, faster, cheaper packaging with a St. Regis System. Multiwall paper bags and valve bag filling machines cut labor costs and container costs and at the same time speed up packaging operations. Moreover, customers like clean, protective, easy-to-handle Multiwalls.

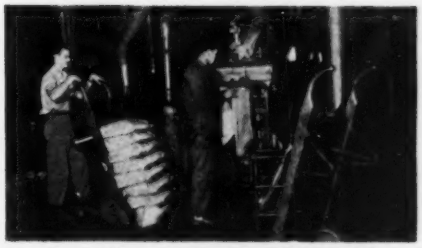
If you pack a granular, pulverized or powdered product, look into the advantages of a St. Regis Packaging System. It can save you money and greatly increase packaging efficiency.

Write today for free copies of any or all of these illustrated case histories. Then ask to have a St. Regis packaging engineer discuss your problems with you and explain how this modern packaging system can be used in your business. Just call or write the nearest St. Regis office.




Case History No. 18—Producer saves ¾¢ per lb.; customer saves ½¢.

Case History No. 19 — Multiwalls protect against moisture-vapor penetration in transit and in storage.



Case History No. 20 — High-speed 152-PB valve bag filling machine gives cleaner, cheaper operation.

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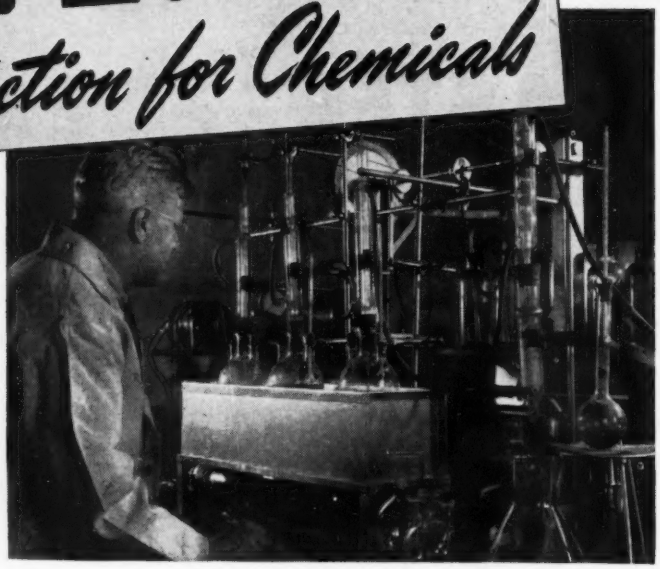
# T.F.P.*

## Protection for Chemicals



Laboratory at the Chicago plant where Steri-Seald Linings for many chemical products have been developed.

. . . WITH Steri Seald LINED

# INLAND STEEL CONTAINERS

Lever locking ring drum—easy to open and reseal air tight.

Our laboratory has developed many interior coatings for steel containers that enable us to offer to the chemical industry a perfect container for many, difficult to pack, chemicals.

Our Steri-Seald lining laboratory is available to help you solve the problem of packaging your chemical products.

***Trouble Free Packaging**

Lever locking ring pail—can be re-sealed, tight.

New Por-Pail lug cover with pouring spout—ideal for liquids.

No. 8 Lug cover pail.

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importance to the chemical industry, and we feel that the results, when obtained, will most definitely justify this survey. The chemical industry, naturally, is interested in the economies of packaging its chemicals in fiber containers, and a great amount of change has been made during the past few years in the substitution of fiber for wood and other materials. This not only effects economies in original cost of containers, but effects large economies in the savings on freight due to the difference in weight of the container.

We shall follow the reports of the Shipping Container Institute as they are announced, as we are confident that they will be of interest to all shippers of chemical products.

### *Sterile Closure For Antibiotics*

An improved type of aluminum seal for penicillin and streptomycin vials is being used by Merck & Co., Inc., manufacturing chemists, Rahway, N. J. The new seal has a flat, circular, tear-off tab that can be removed easily with the

fingers. A tight-fitting dust cap is provided to protect the rubber stopper beneath during storage of the vial between injections. In the picture on the left the tear-off tab, normally not elevated, is raised in the first stage of its removal. In the center illustration the seal is removed from the dust cap. In the picture on the right the dust cap is off, revealing the rubber stopper. The new seals are designed to safeguard further the sterility of the contents. They are used on vials containing 100,000, 200,000 and 500,000 units of penicillin and on those containing the equivalent of 1 gm. and 5 gm. of streptomycin base in the form of the calcium chloride complex.

### *Tank-Car Mileage Allowance Increased*

The Association of American Railroads has approved an increase in the mileage allowance rate for all tank cars, effective January 1, 1948. The allowance rate is changed from 1½ cents to 2 cents per

# Maybe there's a point here about profits for you

Not many people "drank" tomatoes in 1928, for tomato juice was practically unknown.

But today "drinking tomatoes" is a big business, totaling an annual pack of more than 30 million cases.

How come?

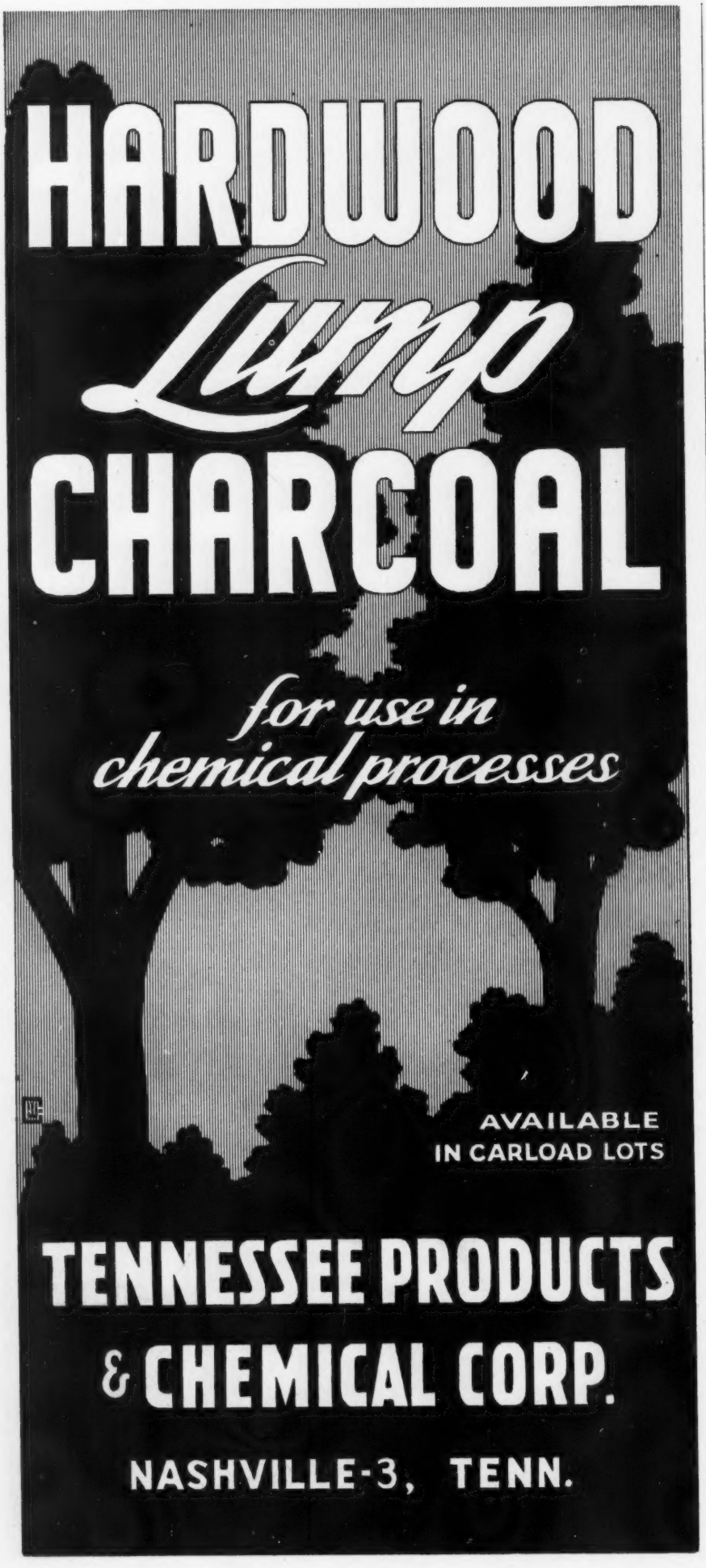
Because of two improvements in canning tomato juice, made by American Can Company.

And just possibly Canco can find—through its many resources and 47 years of package improvement—hidden and extra profits in *your* business, too.

**AMERICAN CAN COMPANY**

CANCO

**New York • Chicago • San Francisco**




mile. This change is covered in Supplement No. 14 to Mileage Tariff No. 7-N, B. T. Jones, Agent, issued November 28, 1947. This increase in mileage allowance is of particular interest to all tank-car shippers. The increased cost of operation, maintenance, etc., of tank cars has made this increase necessary.

### *Tank-Car Shortage Acute*

Never before in the history of the chemical industry has the shortage of tank-cars of all kinds been so acute as it is at the present time; and indications are that this situation will continue to exist for a long time to come. The car builders and suppliers of leased equipment are doing all in their power to alleviate this shortage, but it appears impossible for them either to build or lease sufficient tank-cars to take care of the chemical industry.

The Bureau Car Service Division of the Association of American Railroads is doing all in its power to speed up the handling of existing equipment, both in transportation and in customers' plants. It becomes absolutely essential that all companies either shipping or receiving tank-cars give this matter special attention so far as loading and unloading is concerned. The cars should not be allowed to lie idle either at shippers' or customers' plant, and all parties who have the responsibility of loading and unloading tank-cars of chemicals should be apprised of this very serious shortage in much needed equipment.

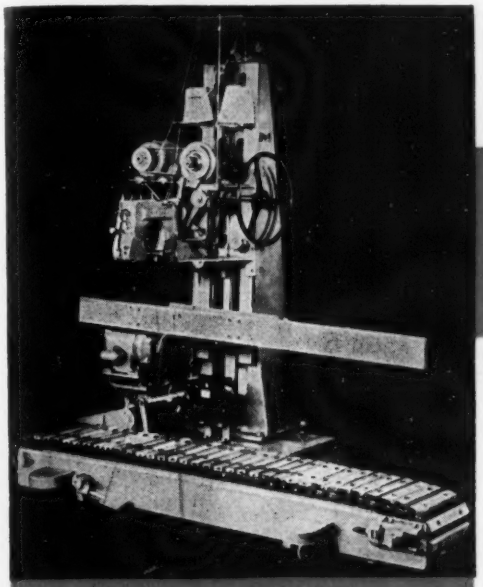
I.C.C. Service Order No. 798, effective December 20, 1947, reimposes demurrage charges on privately-owned tank-cars. Copies of this order are on file with the Interstate Commerce Commission.

### *Laminated Staves in Tight Barrels*

Wood industries' specialists attending the Annual Meeting of the American Society of Mechanical Engineers, in Atlantic City on December 5, learned of the latest thing in barrel construction: the use of glued laminated wooden staves, with plywood heads. The glued laminated wooden arch has in the last 10 years found popular acceptance in the building industry. Its application to barrels was described as "perhaps one of the most drastic changes made in barrel design in many decades."

The barrels described were supplied by the General Plywood Corporation of Louisville, Ky., and were subjected to severe performance tests at the Forest Products Laboratory in Madison, Wis. The same tests were applied to barrels made of solid wood staves and heads. Both types were of white oak. Construction and test results were described by R. S. Kurtenacker, of the laboratory,

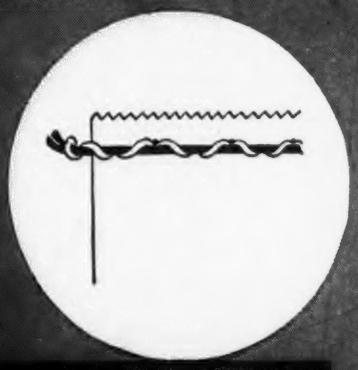
# Strong, Tough Closures
## —mass produced!



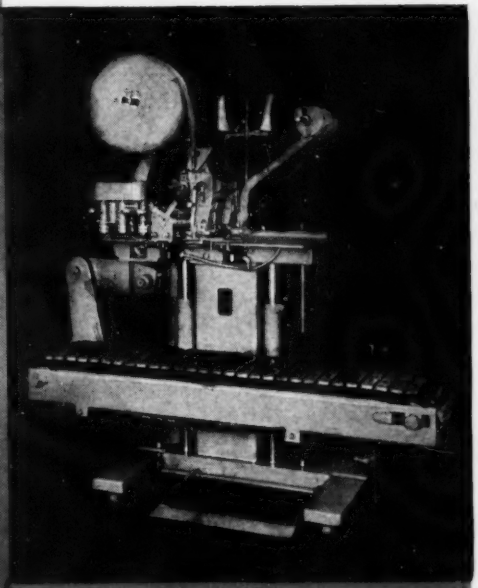
**MODEL "E 1"** (portable)—one operator can close up to 15 filled bags per minute. A single foot pedal controls both conveyor and sewing head. Handles both paper and textile bags.

**Mechanize your closing of heavy-duty, multiwall paper bags, with BAGPAKERS.® You swing into production line speed—up to 15 bags per minute. BAGPAKERS apply famous "cushion-stitch" closure that absorbs strains and won't pull out. When sealed with strong BAGPAKER tape, the "cushion-stitch" closure is moisture-resistant, contamination-proof and *sift-proof.***

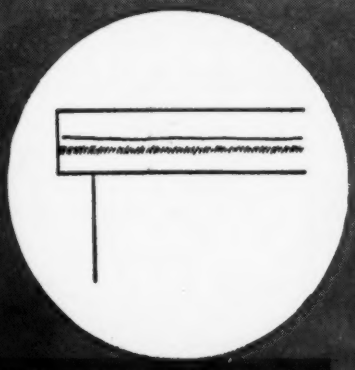
**Talk over your closing and handling methods . . . your multiwall paper bag requirements, with a BAGPAK engineer. He knows ways to speed operations and cut costs.**



ALL BAGPAKERS MAKE THIS FAMOUS "CUSHION-STITCH"



**MODEL "DA"** (portable) applies taped "cushion-stitch" closure. One operator, filling and closing, can handle 2 to 4 bags a minute . . . 6 to 12 where filled bags are delivered to BAGPAKER conveyor. Sewing operation starts and stops automatically—no tape wasted.



TAPED CLOSURE IS MOISTURE RESISTANT—SIFT PROOF—TOUGH
Taped closure is effected on Model "DA"

BAGPAK DIVISION

**INTERNATIONAL PAPER COMPANY, Bagpak Division • 220 East 42nd Street, New York 17**
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# AMINO ACIDS

*for Research, Industrial, and Pharmaceutical Use*

**l-HISTIDINE HYDROCHLORIDE**

$HC=C \cdot CH_2 \cdot CH(NH_2)COOH \cdot HCl \cdot H_2O$

$HN \quad N$

$\quad C$

$\quad H$

**l-CYSTEINE HYDROCHLORIDE**

$HS \cdot CH_2 \cdot CH(NH_2)COOH \cdot HCl$

*Also available for prompt delivery:* Proline, Hydroxyproline, Cysteine, and *dl*-Lysine

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*Makers of Fine Chemicals and Pharmaceuticals*

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Worth 2-2223


and D. L. Patrick, of the manufacturing firm.

One advantage noted in the laminated barrels was that they were apparently not subject to wormholes as were the older type.

The laminated staves were made of four layers of 3/16", rotary-cut, white oak veneer laminated together with a phenol-resin glue. The finished staves were about 3/4". The heads were of five plies, each 3/16", also bonded with phenol-resin; finished they were 15/16".

The barrels, of about 50 gal. capacity, were filled with water for the tests. A compression test on bilge in a 25,000-lb. capacity testing machine revealed "that the laminated-stave barrels sustained greater average maximum loads and with less distortion than the solid-stave barrels."

Drop tests revealed "that the laminated-stave barrels withstood average maximum drop heights of 48 to 51 inches, while the solid-stave barrels withstood average maximum drop heights of 24 to 27 inches."

In the internal hydrostatic pressure test "the laminated-stave barrels withstood greater internal pressures and also exhibited greater tightness."

Tests did not indicate the adaptability of the barrels for aging of alcoholic beverages, the authors concluded.

This barrel is now being investigated by several of the large shippers of liquid chemicals and, from the preliminary studies, they appear to have possibilities for use.

## *ICC Regulations Amended*

*(The following amendments were inadvertently omitted from the listing in the December issue of the changes made by the Interstate Commerce Commission on October 27, 1947.*—EDITORS.)

Section 252 (Packing bromine) has been amended as follows:

(Add) (1) Spec. 105A300W.—Tank cars. The tank must be nickel-clad at least 20% or must be lined with lead at least 3/16" thick; openings in tank heads to facilitate application of lead lining are authorized and must be closed in an approved manner; all closures and appurtenances which are in contact with the lading must be lead-lined or must be made of metal not subject to rapid deterioration by contact with the lading, all interior welds in nickel-clad tanks must be protected by pure nickel butt straps to eliminate iron contamination. The water weight capacity of the tank must not be more than 20,400 pounds, and the maximum quantity of liquid bromine loaded into the tank must not be more than 60,000 pounds or 300% of the water weight capacity of the tank, whichever quantity is the lesser. In no case shall the quantity loaded be less than 98% of the quantity the tank is authorized to carry.

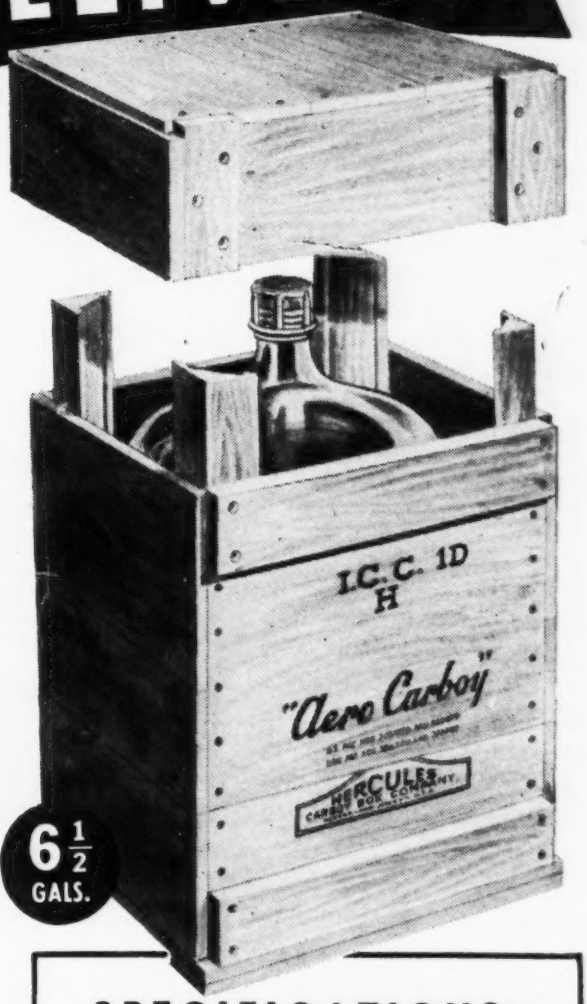
Section 264 par. (o) (3) (Packing

# PROMPT DELIVERY

# HERCULES *Aero*

## (RUBBER CUSHIONED)

# CARBOY BOXES




***6½ gals. normal capacity (7 gals. overflow).*** **Built to withstand an internal pressure of 10 lbs., this new rubber cushioned, completely enclosed, wooden carboy box complies with I.C.C. Regulations for transportation of the 3 principal mineral acids, Hydrochloric, Sulphuric, Nitric. Specific application should be made for other uses.**

**These Features:**

1. Flat cover—no protruding neck—enables boxes to be piled one on top of another for convenient storage. (See illustration at left.)
2. Corner posts provide a convenient handle so that one man can handle carboy. (See illustration at left.)
3. Smaller size and lighter weight makes for easier handling and shipping.

**SPECIFICATIONS:**

BOX SIZE: 13¾"x13¾"x22" Including Hood (I.D.)

WEIGHT: App. 26 lbs. (Box); App. 14 lbs. (Bottle)

CARBOY: 6½ gals. norm. cap. (7 gals. overflow)

CAP: Regulation Polystrene Cap Supplied

COMPLIES WITH CLASSIFICATION I.C.C. 1-D

## *Other* HERCULES *Aero* TYPE RUBBER CUSHIONED CARBOY BOXES Comply with Classification I.C.C. 1-A

5 GALS.

**SPECIFICATIONS**

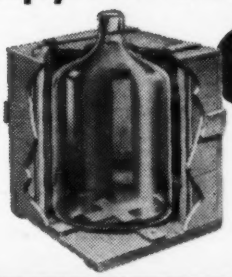
SIZE: 12½"x12½"x17¼" (I.D.)

WEIGHT: Approx. 23 lbs. without bottle

CARBOY: 5 gallons or 42 pints

STYLE: No. 6

Also available with hinged top and in 1, 2, 3 gals.



13 GALS.

**SPECIFICATIONS**

Size: 17½"x17½"x22" (I.D.)

WEIGHT: Approx. 45 lbs. without bottle

CARBOY: 13 gallons

STYLE: No. 15

## NATIONAL BOX & LUMBER COMPANY

HOME OF HERCULES CARBOY BOXES • NEWARK 5, NEW JERSEY

QUALITY CHEMICALS
*in quantity!*

STANDARD HUNT'S CHEMICALS

for product development and processing applications

**POTASSIUM FERRICYANIDE**

***Color Granular***

Versatile chemical with many uses in paper manufacture, synthetic rubber, calico printing, pigments, tempering of steel, photographic bleach and toners, mild oxidizing agent, analytical chemistry, and blue print coating.

$K_3 Fe (CN)_6$

| | |
|---|---|
| Mol. Wgt. | 329.18 |
| Ferrous Salts | trace |
| Sulphates | 0.009% |
| Chlorides | 0.020% |
| Assay | 99.0% |
| Insolubles | trace |

**POTASSIUM METABISULPHITE**

**Granular** $K_2S_2O_5$

Widely used as a preservative in beverages and foods, in photographic developers, dyeing and printing of textile fabrics, lithography and engraving preparations, and as a fine chemical reagent.

*HUNT'S Technical Service can help solve your problems.*

Immediate shipments in commercial quantities.

**HUNT CHEMICAL WORKS, INC.**
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TRADE-MARK

Specialists in the fields of making organic intermediates and of performing custom syntheses with such compounds, *ARAPAHOE* offers the following classes of products and services for 1948:

- *SPECIAL ORGANIC INTERMEDIATES* IN COMMERCIAL QUANTITIES—
  *N-BROMOSUCCINIMIDE* (98.4% min. purity)—mild brominating agent for vitamins, etc.
  *SUCCINIMIDE*
  *CYCLOPENTANONE AND ITS OXIME*—Pharmaceutical Intermediates. (Inquire about Cyclopentyl Alcohol and Bromide also.)
- *ANALYTICAL REAGENTS* IN RESEARCH QUANTITIES—
  *ZEREWITINOFF REAGENT*—determination of active hydrogen atoms.
  *GIRARD'S "T" REAGENT*—isolation of keto-steroids from steroids.
  *2,4—DINITROBENZALDEHYDE*—identification of amines.
- *GRIGNARD REAGENTS* IN RESEARCH, PILOT-PLANT AND COMMERCIAL QUANTITIES—
  EtMgCl, BuMgCl, 2-Thienyl MgBr, EtMgBr, MeMgBr, BzMgCl, MeMgCl, PhMgBr
  —All in Ethyl or Butyl Ethers—
- *THIOPHENE DERIVATIVES* IN RESEARCH AND PILOT-PLANT QUANTITIES—
  2-Thiophenealdehyde; Thenoyl Chloride
  Thiophene-2-Carboxylic Acid; 2-Aminothiophene
  2-Nitrothiophene; 2-Acetamidothiophene
  Purified Thiophene; 2-Acetothienone Oxime
- *NEW ITEMS*—INQUIRE!
  Triphenyl Tetrazolium Chloride; 1,2,3-Tribromopropane
  Lead Tetra-acetate; Ethylene Glycol Dimethyl Ether
- *CUSTOM SYNTHESES* OF SPECIAL ORGANIC COMPOUNDS—
  State your requirements and references to methods with your inquiries!

*For general information, technical data and price quotations, write to Department* "A".

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PRODUCERS OF FINE ORGANIC CHEMICALS


hydrofluoric acid, anhydrous) has been amended as follows:

(o) (3) Spec. 105A300, 105A300W, 105, 105A500, 105A500W or ARA-V. —Tank cars equipped with special valves and appurtenances approved for this particular service. Filling density must not exceed 90% of the pounds water weight capacity of the tank.

Note under Section 264 (o) (3) has been cancelled.

## New Products & Processes

*(Continued from page 90)*

properties, such as the ability to climb out of its container. This unexplained phenomenon and others eventually may be understood through study of the rare form of helium. The new development will be of interest to nuclear researchers.

The single-step process used to concentrate the same isotope of helium makes use of normal mass 4 helium's ability to climb out of its container at low temperatures by means of "film flow." This flow takes place through a surface layer of liquid helium which forms on the walls of the container. The rarer mass 3 atoms remain behind.

### *Standard Hydrocarbons*

Through a cooperative program of the National Bureau of Standards and the American Petroleum Institute begun in 1943, 126 compounds are now available as NBS standard samples of hydrocarbons for calibrating analytical instruments and apparatus in the research, development, and analytical laboratories of the petroleum, rubber, chemical, and allied industries. Most recent additions to the series of compounds are as follows:

| *NBS Sample Number*[a] | *Compound* | *Amount of Impurity*[b] *Mole percent* | *Volume per Unit*[c] *ml (liquid)* | *Price per Unit* |
|---|---|---|---|---|
| 523-5S | 1,2-Diethylbenzene | 0.05 ±0.03 | 5 | $35.00 |
| 525-5S | 1,4-Diethyl benzene | 0.07 ±0.02 | 5 | 35.00 |
| 531-5S | 3-Methyl-1-pentene | 0.30 ±0.20 | 5 | 35.00 |
| 533-5S | 2-Methyl-2-pentene | 0.09 ±0.05 | 5 | 35.00 |
| 534-5S | cis-3-Methyl-2-pentene | 0.15 ±0.08 | 5 | 35.00 |
| 545-5S | 2,4,4-Trimethyl-1-pentene | 0.09 ±0.03 | 5 | 35.00 |
| 546-5S | 2,4,4-Trimethyl-2-pentene | 0.08 ±0.05 | 5 | 35.00 |

[a] The designation "-5S" following the sample number indicates a sample of 5 ml sealed "in vacuum" in a special Pyrex glass ampoule with internal "break-off" tip.
[b] The purity has been evaluated from measurements of freezing points, as described in J. Research Natl. Bur. Standards *35*, 355 (1945) RP1676; unless otherwise indicated
[c] Tolerance approximately ±10 percent.

Instructions for transferring standard samples of hydrocarbons "in vacuum" are available on request. A complete list of NBS standard samples of hydrocarbons, together with instructions for ordering, may also be obtained from the National Bureau of Standards, Washington 25, D. C.

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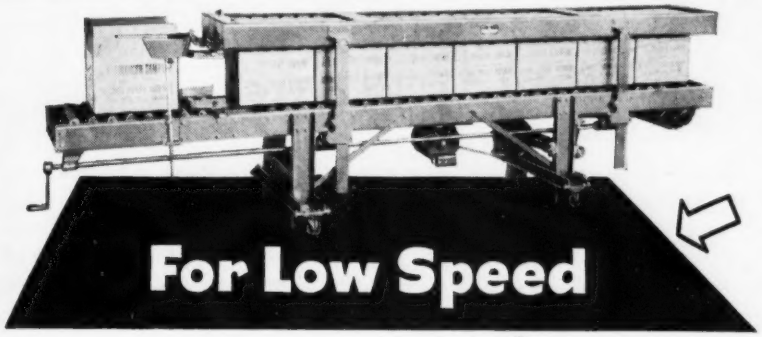

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Whether your shipping case gluing and sealing operation is large or small, continuous or occasional, you will find PACKOMATIC case gluing and sealing equipment to help you.

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# PLANT OPERATIONS NOTEBOOK

## *Longer Life for Flexible Duct Connectors*

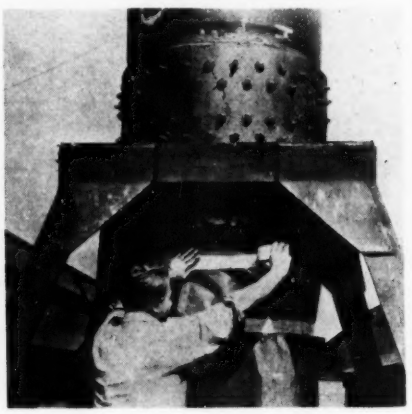
FLEXIBLE duct connectors, as employed in a wide variety of industries, are subjected to corrosive fumes and other severe service conditions. Long life on such applications is highly desirable but not always easily obtainable.

The Acme Steel Co., Chicago, Illinois, has successfully employed Fiberglas-backed industrial adhesive tapes and rubber-coated Fiberglas fabric to replace other materials which proved unable to stand up for more than short periods, or which for other reasons proved unsatisfactory.

At Acme's Riverdale (Illinois) plant, blowers connected with large stacks, 24 inches in diameter and 20 feet high, carry off sulphuric acid fumes from vats used for pickling sheet steel. The flexible duct connectors regularly rotted out in less than three months.

The photographs show how glass-backed adhesive tapes and rubber-coated glass cloth have been used to remedy this.

***Rubber-coated glass fabric being applied as flexible duct connector material on one of the stacks that carry off sulfuric acid fumes from pickling vats at Acme Steel Co.'s Riverdale, Illinois, plant.***



***Applying glass-backed adhesive tape as a final seal for the flexible duct connector. A double-coated glass-backed adhesive tape was used on the flanges of the stack before the fabric was applied.***

## *NOMOGRAPH-OF-THE-MONTH* Edited by DALE S. DAVIS

*Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.*

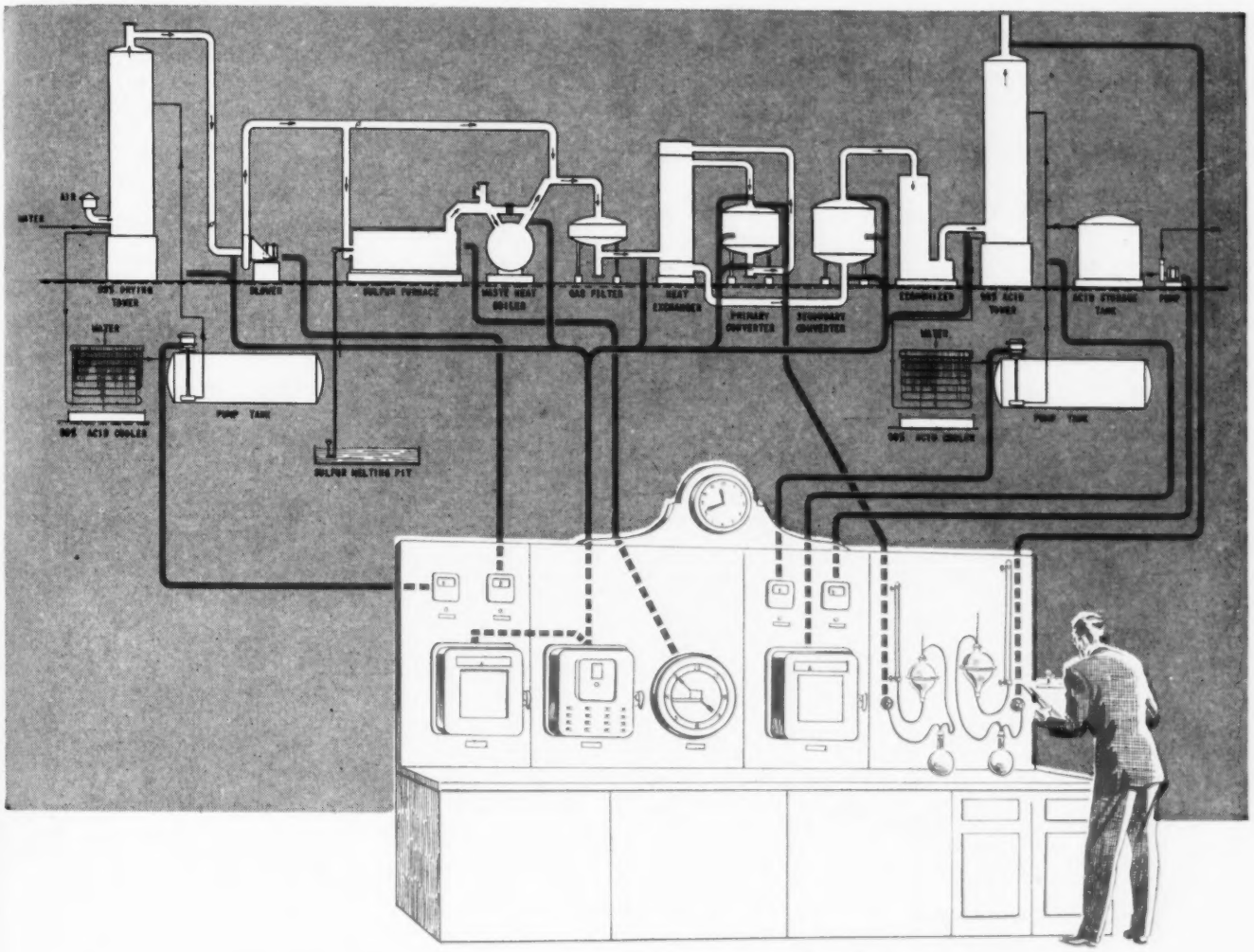
## *Determination of Pipe Sizes and Carrying Capacities of Steam Lines*

*by C. J. Major*
*2252 Fifteenth St.*
*Wyandotte, Mich.*

IN most applications a reasonable pressure drop for steam in a pipe line is one pound per square inch per hundred feet of pipe. Using this value in the familiar Fanning equation (3), one obtains a family of essentially straight and parallel lines when weight rate of flow is plotted against internal pipe diameter on logarithmic scales. Each line in this family represents a given temperature and pressure combination. The following empirical equation has been developed from the data of such a plot:

# It Takes One Man

## TO OPERATE A CHEMICO ACID PLANT



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3. **Synthesis of ethinyl compounds.**
4. **Synthesis of acetylenic carbinols.**

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Division LITHIUM CORPORATION OF AMERICA, INC.

$$W = (0.262 - 0.00017S)\,d^{2.6}\,(p + 14.7)^{0.502}$$

where W = rate of flow of steam, pounds per minute.
S = superheat, degrees Fahrenheit.
d = actual internal pipe diameter, inches.
p = average line pressure, pounds per square inch, gage.

Steam viscosity data of Hawkins, Solberg, and Potter (2) were used in the correlations and Fanning friction factors for clean commercial iron and steel pipe were employed.

The equation is solved by means of the accompanying nomograph constructed by well-known methods (1). It will be noted that the chart may be used for either saturated or superheated steam.

To solve for pipe diameter, draw a straight line through the given values of superheat and average pressure until it intersects the reference line. From the point of intersection, draw a second straight line through the rate of flow and read the required pipe diameter. Select the next standard pipe size above the actual diameter determined. The same procedure is used to solve for the carrying capacity of a given pipeline except that rate of flow is the unknown variable.

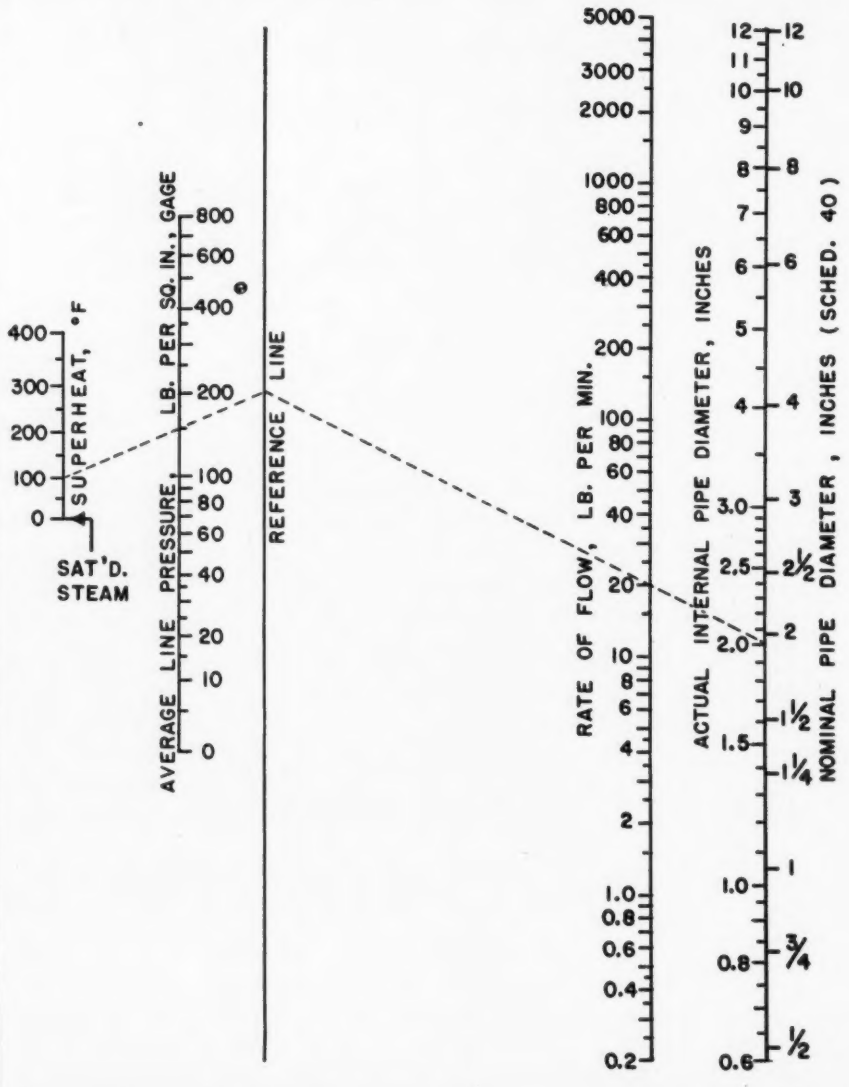
The broken lines on the chart show that a 2-inch pipe is required for 20 pounds of steam per minute flowing through a line when the average pressure is 150 pounds per square inch, gage, and the superheat is 100°F.

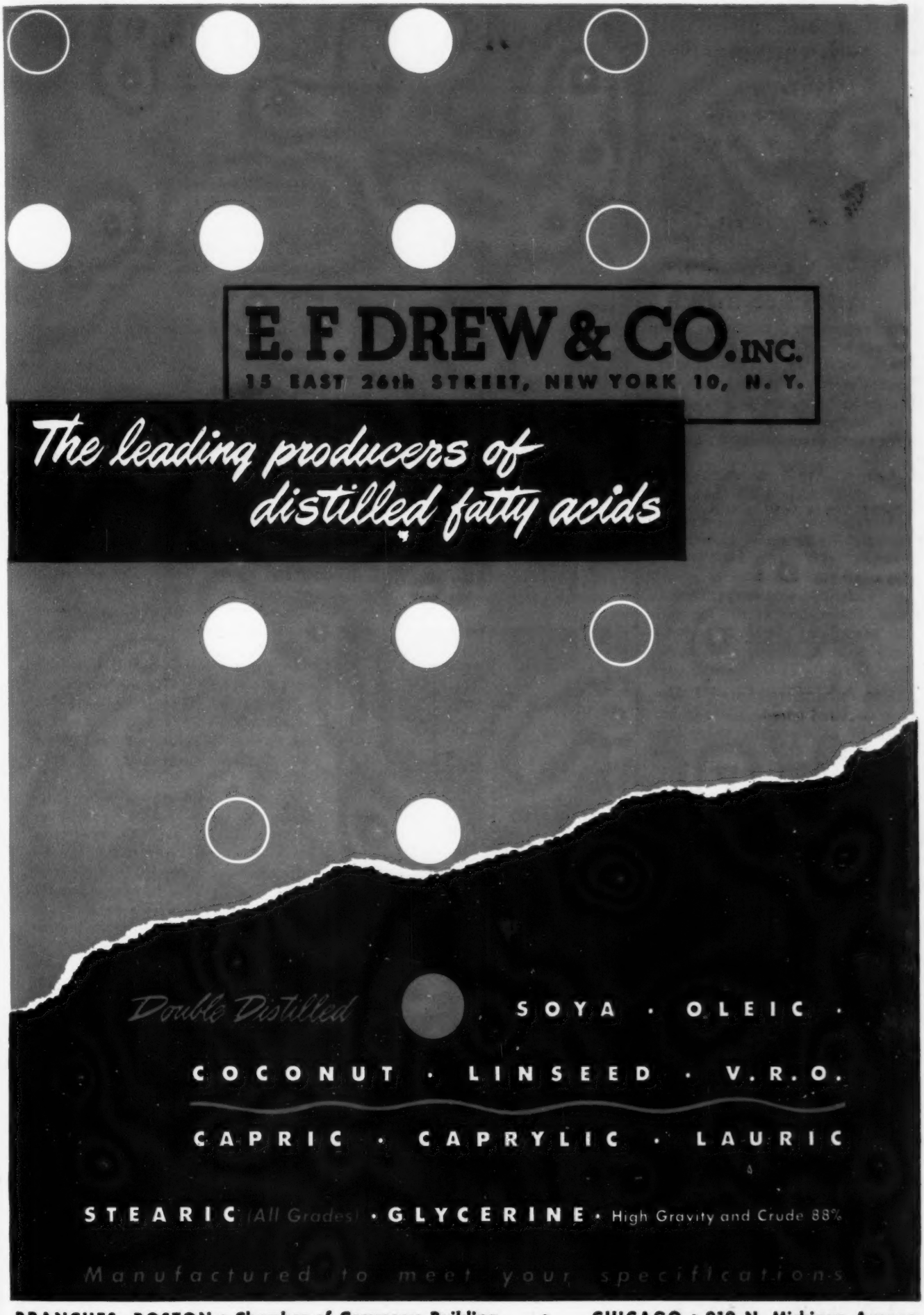
### *Literature Cited*

1. Davis, D. S., "Empirical Equations and Nomography," Chap. V, New York, McGraw-Hill Book Co., 1943.
2. Hawkins, Solberg, and Potter, **Trans. Am. Soc. Mech. Engrs.**, *62*, 677, (1940).
3. Perry, J. H., "Chemical Engineers' Handbook," 2nd ed., p. 805, New York, McGraw-Hill Book Co., 1941.

## *Bearing Dismounting Time Cut*

Application of oil at a pressure of 7000-8000 psi reduces dismounting time for large anti-friction bearings from hours to 10-15 minutes, according to SKF Industries, Inc. The oil is pressured between the bore of the bearing and the shaft, expanding the inner ring. This "floats" the bearing on an oil film, allowing easier removal.

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**The top plate is made of a special metal able to resist growth and warpage. It is designed with rounded edges and an apron to protect the underlying elements from spillage. The surface of the top plate is "metallized" to resist corrosion and minimize discoloration caused by spillage.**

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# LABORATORY NOTEBOOK

## *Universal Clamps For Laboratory Apparatus*

For the quick assembly of rigid laboratory frames of all types and requirements the Emil Greiner Co. is offering a new universal clamp. Various modifications permit complete versatility including multiple rod attachment at any two dimensional angles—a swivel attachment to give any three dimensional angles—also a special attachment for wall and floor mounting and couplings.

Both rods and clamps are corrosion resistant, light in weight and will not disintegrate in a Bunsen burner flame. Rods cost 25c per foot and the clamps range from 60c to $1.50 for the most complex swivel type.

## *Rubber Hardness Gauge*

An improved device for measuring hardness of rubber and similar compounds is being manufactured by United States Rubber Co. Known as the Rex hardness gauge, the instrument combines

simplicity of operation with high accuracy and excellent reproducibility of readings.

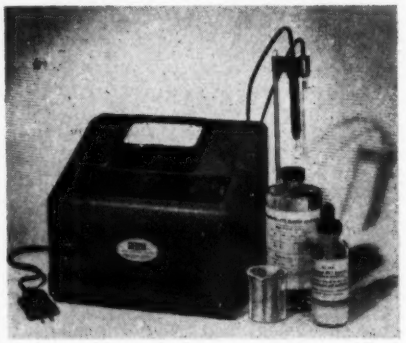
The gauge, which is the size and shape of a large fountain pen, is operated when an indenter at one end is pressed firmly against the surface to be tested for hardness. The gauge indicator holds its position indefinitely so that exact readings can be obtained.

The instrument reads in the same units as the Shore durometer and meets the requirements of the latest rubber hardness test method issued by the ASTM.

There are no gears, cams, levers or pivots in the gauge to get out of order. Unless it is abused, it need never be calibrated. Repeated tests on the same surface give duplicate readings by the same or different operators.

## *AC Glass Electrode pH Meter*

National Technical Laboratories has developed a portable glass electrode pH meter which combines maximum accuracy and versatility with the convenience of



full AC operation, can be plugged directly into any standard 110 v. 50/60 cycle AC line, and can be easily transported from one location to another or installed permanently.

This model covers the full scale of 0 to 14 pH and can also be used for making millivolt readings within the range 0 to ± 410 millivolts. Measurements of pH can be made to an accuracy of 0.03 pH unit, and millivolt readings to 2 millivolts.

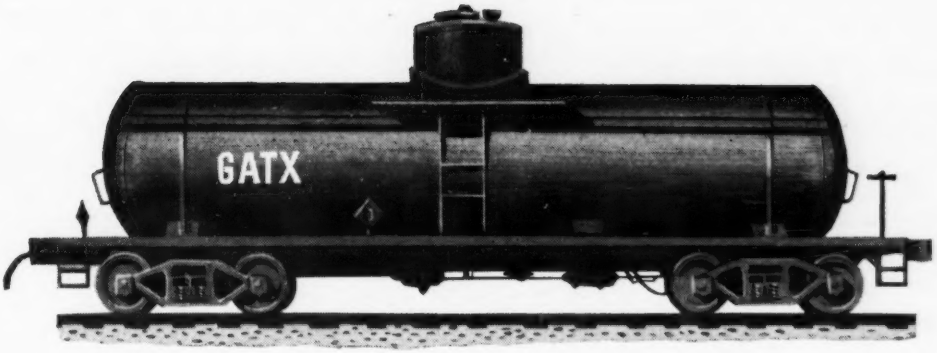
Standardization with one buffer gives accurate measurements over the full range of the instrument, thus eliminating cross checking between two buffers. The instrument may be checked and corrected for drift at any time by simply pressing a button on the electrode terminal and bringing the needle to the pointer position with the standardization control.

Also featured is a built-in temperature compensator dial calibrated 0 to 100 degrees C. which can be set at the temperature of the test sample.

The instrument is very compact, measuring only 12" x 9½" x 8½" overall, and with a net weight of only 14 lbs. It has a power consumption of 35 watts and is supplied complete with electrode support rod, electrode holder, glass electrode, calomel electrode, pint of pH 7.00 concentrated buffer, 100ml saturated KCl solution and 50 ml Pyrex beaker.

## *Porcelain Enamel Adherence Tester*

The evaluation of adherence of porcelain enamels to metal—an important criterion of the quality of an enamel ground

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FERROUS SULFATE CRYSTAL, USP or REAG.
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coat—can be measured electrically with the enamel-to-metal adherence tester developed at the National Bureau of Standards, Washington 25, D. C. The instrument consists of a test head, specimen holder, and control cabinet with a magnetic counter.

In operation the plastic test head (containing 169 spring actuated steel probes 0.10 inch on centers) is lowered onto the specimen test area which has been deformed in a specified manner. The springs adjust the probes to the contour of the specimen. A synchronous motor drives the selector switch and each circuit in turn is automatically tested. If a given probe is touching bare metal, a relay actuates a magnetic counter and the total number of probes in contact with bare metal over the test area is recorded. From this total the fraction of the deformed area on which bare metal is exposed, and that still coated, may be readily computed, giving an index of adherence.

### *Midget Microscope*

A new design satin nickel-finish microscope no larger than a pocket fountain pen, but easily adjustable to give 40, 50, or 60 power self-illuminating magnification is being manufactured by E. W. Pike & Co., Elizabeth, N. J. Price including leather case is $18.50.

### *pH Meter*

A new pH Meter combines the high accuracy of a laboratory-type instrument with the ruggedness and simplicity of operation of an industrial model. The large indicating meter is equipped with a 7-inch scale and mirror for convenient readings and high precision. The meter covers the complete pH range, no reversal switch being required.

The instrument is always ready for immediate readings. It is standardized with the aid of a single buffer solution and a single control knob. A tell-tale hand is provided to mark the reference point. This makes it possible to restandardize the instrument in the course of actual measurements without the use of a buffer. A wide range temperature control for 0-100°C obviates the necessity of consulting temperature correction charts.

No batteries are employed. The instrument operates directly on any AC power line of 50-60 cycle frequency. It is useable on any voltage between 90 and 275 volts.

The standard glass electrode furnished with the instrument is fully shielded. It can be used either attached to the pH meter or installed some distance away. The shape of the standard set of electrodes makes it possible to carry out measurements on quantities as low as 5 ml.

This Photovolt Electronic pH Meter Model 100, complete with one shielded glass electrode, is listed at $225.00.

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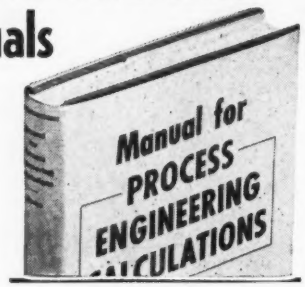


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Makes available in handy reference form a compilation of data on modern methods used in the manufacturing of chemicals and chemical products. Manufacturing procedures for all chemical process industries are analyzed and described by flow sheets showing the interrelationship of the basic unit processes and operations.

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# INDUSTRY'S BOOKSHELF

## *Dyeing Manual*

VAT DYESTUFFS AND VAT DYEING, by *M. R. Fox*. John Wiley & Sons, Inc., New York, 1947. 323 pp., $5.50. Reviewed by Byron L. West and Ormond W. Clark, Calco Chemical Division, American Cyanamid Co.

THIS BOOK is devoted almost exclusively to dyeing with vat dyestuffs. Less than 10 per cent is devoted to their history or chemistry. For the student chemist it is an excellent introduction; and for the student dyer or for those dyers who do not have access to a good library of color cards or textile literature, it should prove of great interest and value.

The chapter on identification of vat dyes is especially good, and the section presenting a complete list of analogous vat dyes should be of particular value to all American dyers and chemists, for it includes European as well as American dyes.

The book appears to be primarily a compilation in one volume of descriptive material selected from the color cards of various dye manufacturers, supplemented by brief abstracts from recent textile literature. Little critical evaluation of the material is evident, and those skilled in the art of vat dyeing are apt to feel that the book must be read with considerable discrimination. It is uneven in content and treatment of many subjects. Perhaps a book of such limited size is far too small to cover the subject satisfactorily for those to whom it should be most invaluable.

If Mr. Fox would take his book as a working basis and outline, and expand it to perhaps double its present size; if he would cover each subject completely and make full use of the important articles scattered in the literature, he would produce a carefully assembled and skillfully edited revised edition that should meet with eager acceptance.

## *Revision of Conant*

THE CHEMISTRY OF ORGANIC COMPOUNDS, *by James B. Conant and A. H. Blatt.* Third edition, The Macmillan Co., New York, 1947. 665 pp., $5. Reviewed by Howard C. E. Johnson, Chemical Editor, CHEMICAL INDUSTRIES.

MOST organic textbooks are too "academic"; i.e., they teach a species of chemistry quite different from that found in industry. That general criticism does in no wise scathe Conant and Blatt's new book, for it is written with current industrial practice constantly in mind. Emphasis in this latest revision of Conant's previous texts is on reaction rates and equilibria as they permit or preclude practical utilization of organic reactions.

One might wish that the up-to-dateness of the material were more consistent. (The synthesis of niacin and its derivatives, for example, is a 1,000,000-lbs.-per-year industry; but only the obsolete method of preparation—oxidation of nicotine—is given, and the newer synthesis from pyridine, via $\beta$-bromopyridine and $\beta$-cyanopyridine, is not mentioned). But in general the choice of material is sound.

More important is the pedagogical approach. The lucid, logical organization of Conant's previous texts has been retained. Whatever changes in order of presentation have been made are in the interest of even further clarity. The boundaries of organic chemistry as such—as differentiated from physical chemistry, engineering and biochemistry—are implied by the degree of emphasis on border-line topics.

The first two editions of this book have been used, because of their excellence, in some of the outstanding academic chemistry departments in the country. The new text carries on the high tradition.

## *Other Publications*

STEAM JET EJECTOR AND VACUUM COOLING SECTION STANDARDS, second edition, consists of three parts: steam jet ejectors, test code for steam jet ejectors and steam jet vacuum refrigeration equipment. Recommendations on nomenclature, operating principles, types of assemblies, capacity, standard accessories and materials of construction are given. Heat Exchange Institute, 90 West St., New York 6, N. Y. $1.00 per copy. $0.75 per copy on quantity orders for student use.

SPECIAL TREATMENTS OF WOOD, a collection of eight papers presented at the March 20th meeting of the Northeastern Wood Utilization Council. Discussions of fire retardant treatments, lumber impregnation, and new developments in resin adhesives are included. The council, P. O. Box 1577, New Haven 6, Conn. Bull. 18, $2.00.

1947 CLASSIFIED DIRECTORY, ELEVENTH EDITION. ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC., 50 East 41 St., New York 17. 120 pp.

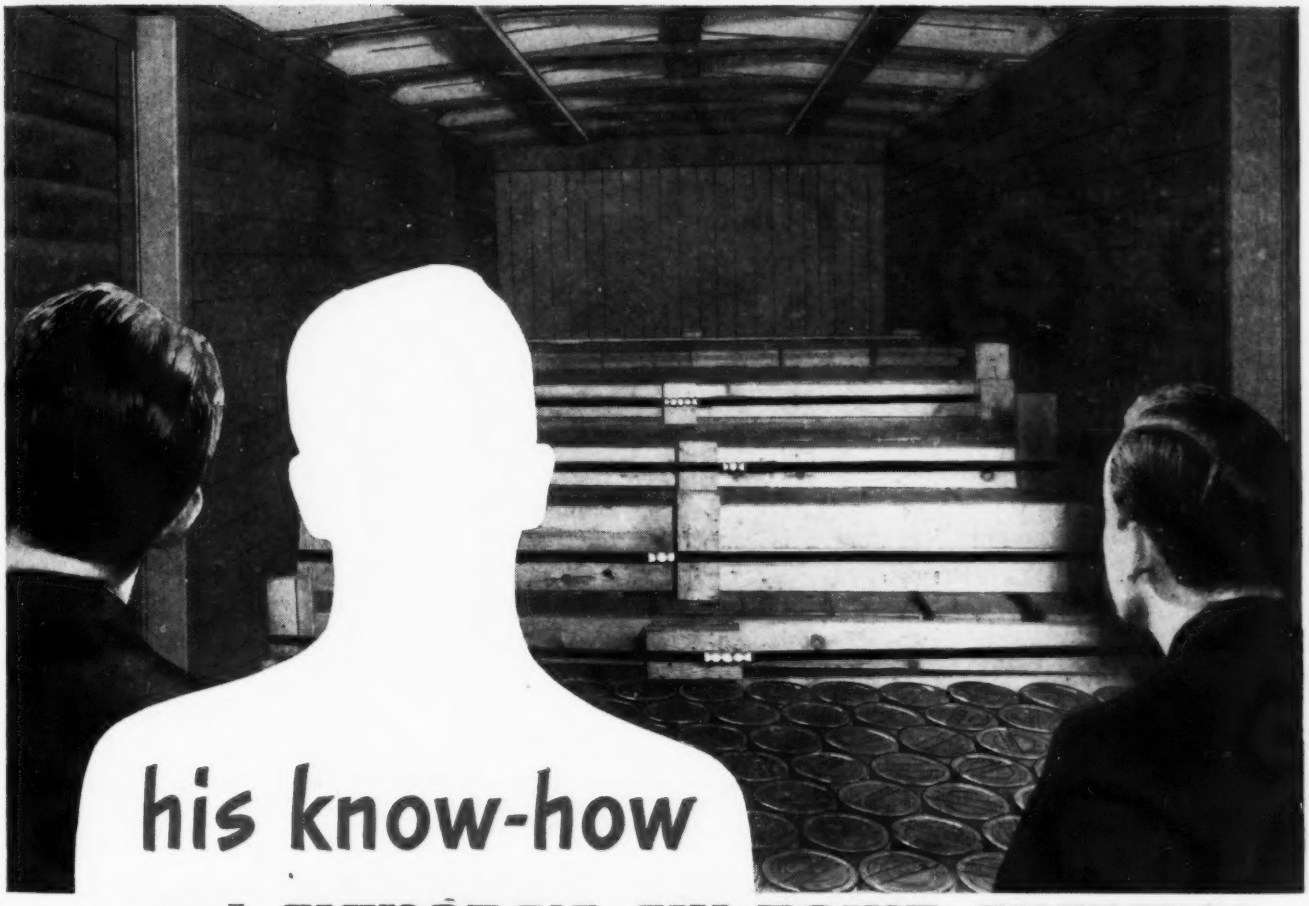
APPLIED MECHANICS REVIEWS, a new monthly devoted to a review of current world-wide literature in the field. First issue, January, 1948. Engineering Societies Building, 29 W. 39 st., New York 18.

DIRECTORY OF AMERICAN COUNCIL OF COMMERCIAL LABORATORIES, a guide to independent testing research and inspection laboratories. Executive secretary, 225 Broadway, New York 7, N. Y. 37 pp.

HOW TO PREPARE AND MAINTAIN A SUPERVISORS' POLICY MANUAL, a handbook based on a survey of company practices. American Management Association, 330 W. 42 St., New York 18, N. Y. 71 pp. Price $3.00.

INCOMES OF PROFESSIONAL ENGINEERS IN PUBLIC EMPLOYMENT, prepared by Arthur Richards. American Association of Engineers, Chicago, Ill. 24 pp.

INSTRUMENTATION AND CONTROL IN THE GERMAN CHEMICAL INDUSTRY, by C. H. Gregory, the official report of a first-hand investigation made in German factories in 1946 by a team of British experts. Includes translations of German documents. Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y. Price $6.00.



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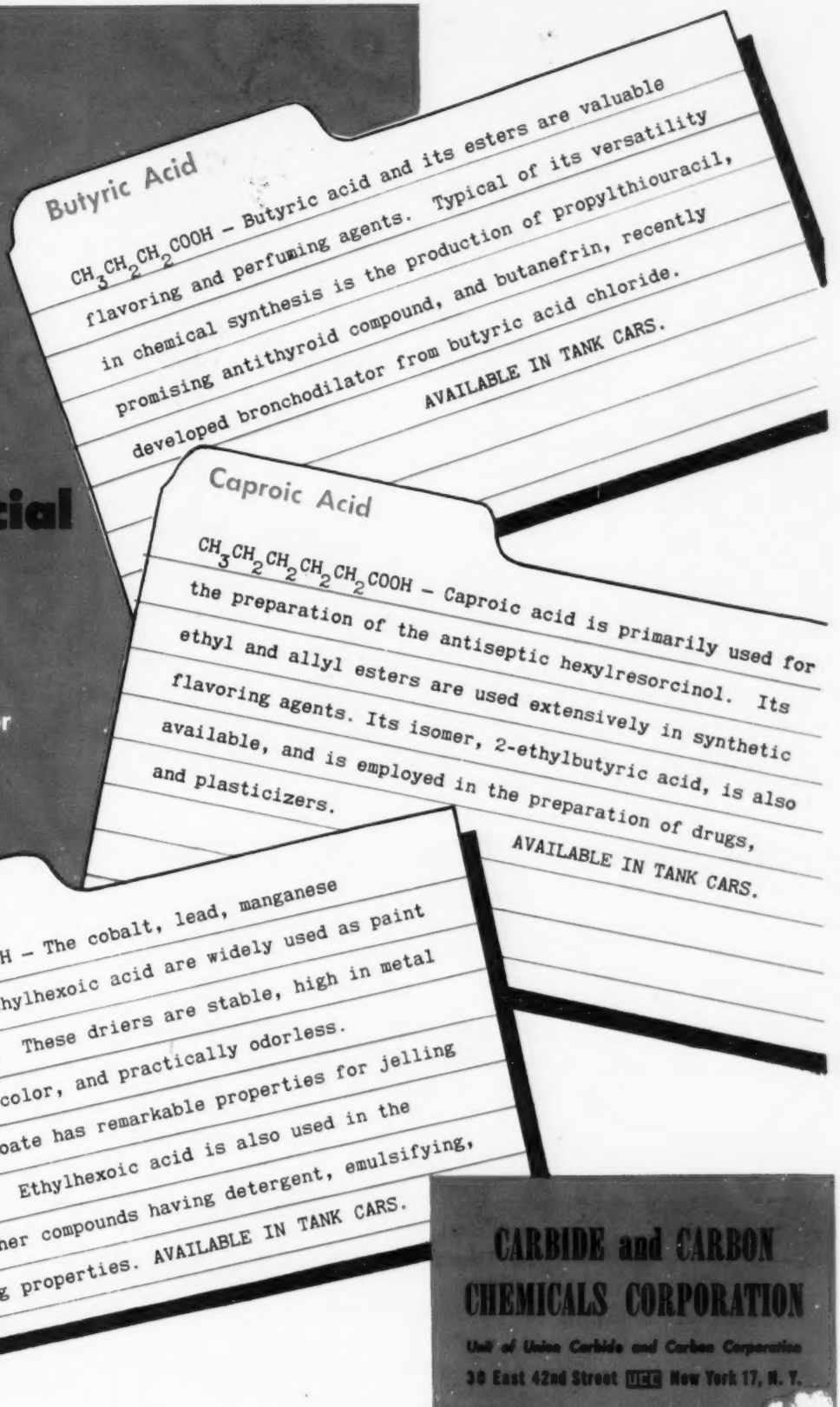
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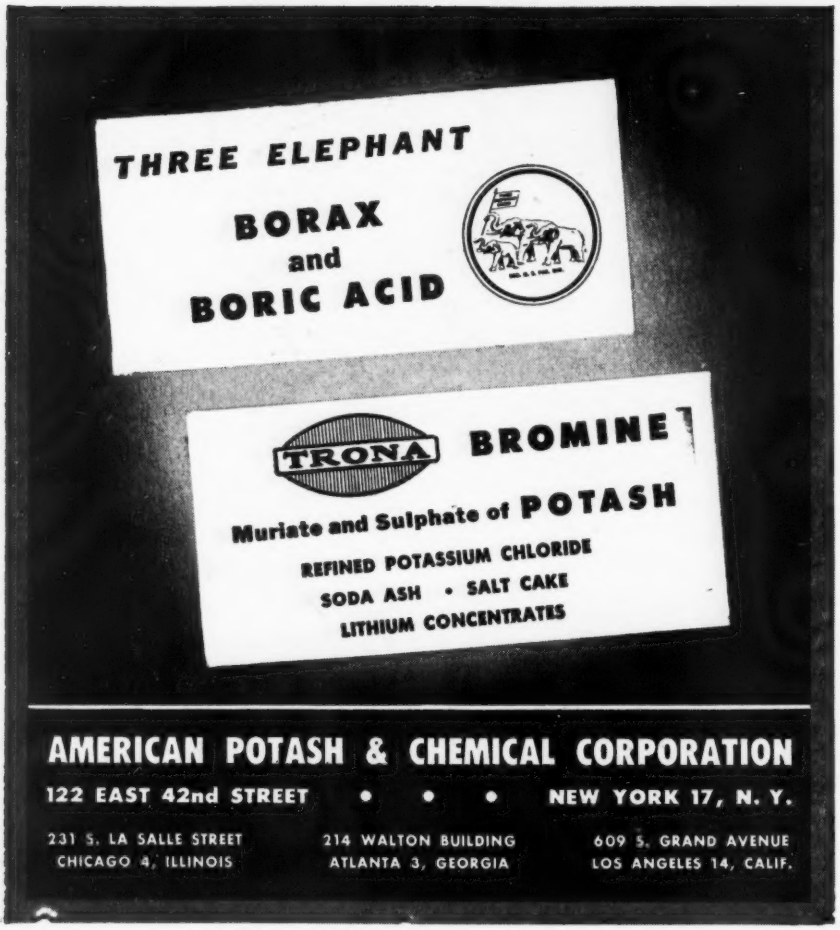


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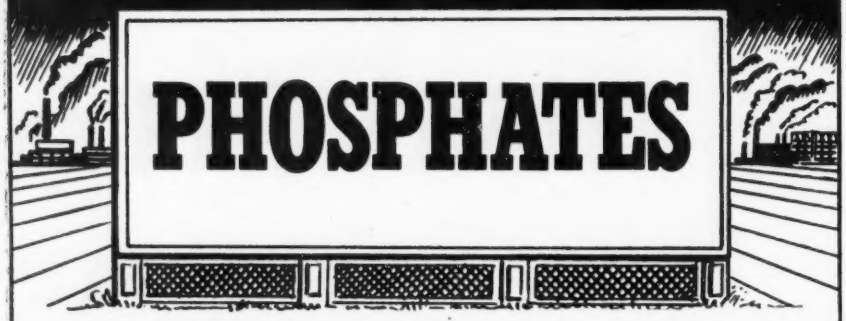


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WALLACE REED BRODE has been appointed associate director of the National Bureau of Standards. He succeeds HUGH L. DRYDEN, who was recently appointed director of aeronautical research of the National Advisory Committee for Aeronautics.

ALFRED L. FENTON, age 64, director of the agricultural department of the Texas Gulf Sulfur Co. in Houston, Texas, died December 8. With the company fifteen years, he was responsible for much of the soil and animal research work in this field now being conducted in agricultural colleges. He organized the agricultural department of the company and it feels any success attained must be attributed to him.

GERALD WILSON has been appointed district contract manager for the Eastern District by The H. K. Ferguson Co.

Mallinckrodt Chemical Works, St. Louis, has appointed ELDON W. MICHAELS sales representative for the territory comprising western Missouri, Kansas, and Colorado. He will maintain headquarters at Kansas City, Missouri.

MORROUGH P. O'BRIEN, former dean of engineering of the University of California has joined the engineering staff of Air Reduction Co., Inc. He will be in charge of general and process engineering and, will assume the direction of liquefaction research.

T. G. GILL has joined the laboratory staff of the Timber Engineering Co.

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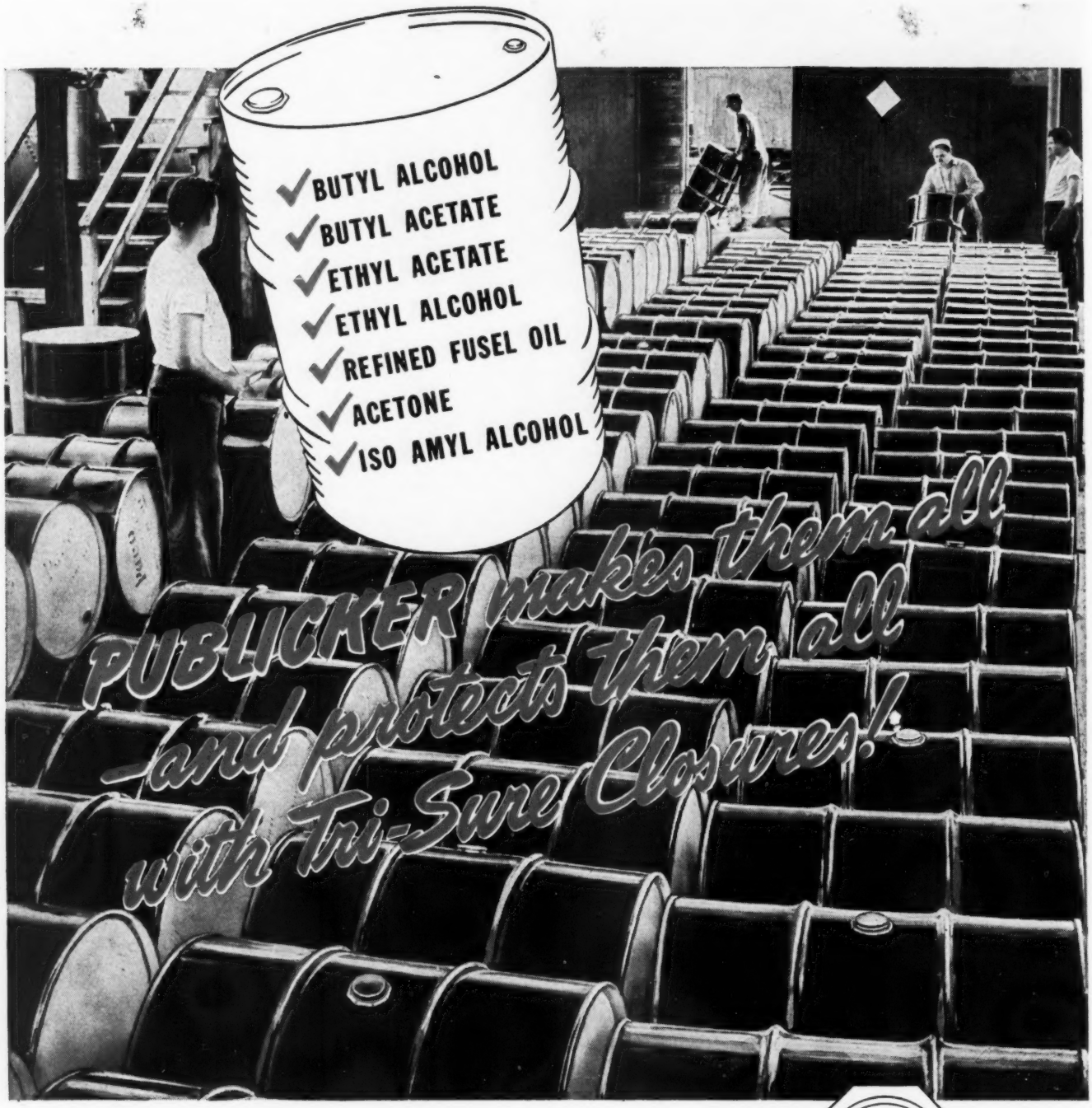


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# NEWS OF THE MONTH

### *Amend Latex Order*

The Office of Materials Distribution has amended Rubber Order R-1 to permit unlimited use of natural latex in all latex foam products other than certain sizes of seat cushions.

The agency says that it expects that the relaxation of controls will encourage imports of natural latex into this country, as well as eliminating many technical manufacturing difficulties encountered in blending natural and synthetic latex.

### *Chemists Elect Pauling*

***Linus C. Pauling, chairman of the division of chemistry and chemical engineering of the California Institute of Technology, has been elected president of the American Chemical Society for 1949. Dr. Pauling is one of the world's leading theoretical chemists.***

### *Bakelite Charts Expansion Plans*

The most extensive program for the expansion of plastics manufacturing facilities in the 37-year history of Bakelite Corp. is now in progress and is scheduled for completion during 1948. Facilities for production of all plastics and resins marketed by the corporation will be increased by 50 to 60 per cent. On individual products, increases will range from 30 to 400 per cent. The program includes construction of three new plants and expansion at three existing plastics-producing plants.

A new works at Ottawa, Illinois, for the processing of Vinylite resins into plastic film, sheeting and rigid sheets, has been built and some production is already under way. The plant is expected to be in full production by next spring.

Production of vinyl resins at the South Charleston, West Virginia, plant has been substantially increased and the new Texas City, Texas, plant, which also produces Vinylite resins, is now in operation.

A program of expansion is also in progress at the Bound Brook, New Jersey, plant. By June of next year this plant will be ready to produce polystyrene at the rate of 25 million pounds annually. All production of polystyrene at the Bloomfield, New Jersey, plant is being transferred to Bound Brook.

By May of 1948, facilities at Bound Brook for the manufacture of phenolic molding materials will also be increased by approximately 30 per cent.

A new plant at Monterey, N. L., Mexico, recently began operation for the production of general-purpose phenolic molding materials. The plant will also act as Mexican sales agent for all of Bakelite's products.

Another new plant is being constructed in Canada, near Belleville, Ont. This plant of Bakelite Company (Canada), Ltd., is expected to be completed the latter part of 1948. Phenolic plastics and resins and urea resin glues, which are now made at the Toronto plant, will be produced there.

### *Ruling Spurs Interest in Cadmium Battery*

The U. S. District Court in New York has ordered the Electric Storage Battery Co., Philadelphia, and its subsidiary the Willard Storage Battery Co., Cleveland, to make available to competitors on a reasonable royalty basis, patents exchanged with three foreign companies with which the U. S. firms were judged to have been participating in an international cartel.

One effect of such arrangements, according to the complaint, was to limit the sale in the U. S. of cadmium type storage batteries. This battery, developed in Europe, is claimed to be superior to the lead type, particularly as to longevity.

### *Exploit Pennsylvania Clay Deposits*

A good recovery of alumina has been obtained from diaspore clay deposits surveyed in central Pennsylvania by Bureau of Mines engineers and estimated to contain some 5,000,000 tons.

The project was undertaken during World War II to find new ways to produce alumina from available domestic resources and thereby help meet the unprecedented demand for aluminum for military uses.

From 87 to 90 per cent of alumina was recovered from these clays through a Bureau sintering process using soda ash, limestone, coal, and fuel oil. For each ton of alumina produced in Bureau tests, 360 pounds of soda ash, 1.88 tons of high-calcium limestone, 1.6 tons of coal, and about 47 gallons of fuel oil were required.

Although the alumina content of these clay deposits ranges from about 30 to 75 per cent alumina, the average content is from 45 to 50 per cent, with varying percentages of silica and iron oxide minerals. In past years, the clay has been used in the manufacture of refractory brick.

### *Phillips Plans Missouri Unit*

The Chas. H. Phillips Co., Division of Sterling Drug, Inc., will open a new $750,000 plant at Gulfport, Mo., early this year. It will be devoted to the manufacture of the company's milk of magnesia, toothpaste, and face creams.

According to O. W. Ergenzinger, vice-president, the corporation's sales have doubled since 1939.

### *Slayter to Receive Medal*

***Games Slayter, vice president in charge of research and development of Owens-Corning Fiberglas Corp., has been chosen to receive the 1948 Industrial Research Institute medal. The medal is presented for industrial research achievements.***

### *Debate Fertilizer Controls*

This country's plans to supply Europe with fertilizer in 1948 may involve wide impacts on other chemical production.

Over the protest of American fertilizer interests, the Department of Commerce wants to return to full wartime controls over nitrogen and nitrogenous fertilizers.

Included in the range of wartime powers it is seeking are: (1) authority to arbitrarily schedule production and order set-asides for export in the fertil-

izer industry itself; (2) force the return to fertilizer production of facilities which since June 30, 1947, have been diverted to other chemical manufacture; (3) allocation authority over anhydrous ammonia and other nitrogen compounds, and control over export prices of nitrogenous fertilizers. Also, control over high-pressure tank cars would be tightened.

There is an apparent deficit in 1948 of approximately 87,000 short tons, contained nitrogen, between supplies and the combined domestic and export requirements now anticipated.

The present European aid appropriation provides $35,000,000 worth of fertilizer for shipment abroad, including $14,000,000 of nitrogenous fertilizer.

## USI Names Manninen

***T. H. Manninen, appointed manager of development, U. S. Industrial Chemicals, Inc. He received his Ph.D. degree from Columbia, and has been associated with USI since 1937.***

## Chemicals Wanted

The following chemicals are wanted by the National Registry of Rare Chemicals, Armour Research Foundation, 33rd, Federal and Dearborn Sts., Chicago 16, Ill.:

1,1,1-Trichloro-2,2-bis(p-aminophenyl)ethane
Sodium fluophosphate
Catechol mono allyl ether
4-Phenylguaiacol
3-Methoxypyrocatechol
Camphenilone
Isocamphane
Potassium aluminum borate
3-Amino-1,2,4-triazole
Mono, di or trichlorophthalic anhydrides
m-Cresylene diamine
4-Methyl-1,3-quinazoline
4-Chloro-1,3-quinazoline
Germanium sulfide
Germanium halides
3-Furfuryl alcohol
3-Furaldehyde
Hydroquinone sulfonic acid
Cyclooctatetraene
Pyrotartaric acid

## Fertilizer Exports Gain

Exports of fertilizers and fertilizer materials during September 1947 amounted to 126,000 short tons, valued at $2,063,000.

Cumulative exports for the first nine months of this year totaled 1,151,000 short tons, valued at $25,190,000. By tonnage, such exports were 21 per cent above last year and 70 per cent above January-September 1945. Compared with January-September 1946, cumulative exports were higher for all classes of fertilizers and fertilizer materials.

## Air Reduction Aims To Pare Costs

The Air Reduction Co. is expanding its process engineering facilities for the purpose of reducing chemical manufacturing and distribution costs through an intensified program for the development of more economical plants and methods.

Expansion of the manufacturing plants of the company's subsidiary, the National Carbide Corporation, will be the keynote of this move, because the results of the experimental program initiated some two years ago indicate that present manufacturing costs in the industry, including those of National Carbide Corp., are subject to reduction.

New facilities for the program are under construction at Stamford, Conn.

## Liberalize Chemical Export Regulations

The value limits of a selected list of chemicals which may be exported under general license to Group E and Group K destinations were modified recently by the Office of International Trade.

Somewhat more liberal classifications were accorded to: chromic acid, potassium chromate, potassium chlorate, potassium perchlorate, sodium bichromate, sodium nitrate and chrome pigments. However, none of the new GLV limits exceeds $100.

## Changing Pattern Of Explosives Use

Consumption of industrial explosives in the United States during 1946 advanced to a total of 536,314,652 pounds which was 17 per cent greater than in 1945. This gain in 1946 reversed the slow downtrend which started in 1943 and persisted through 1945. Consumption in 1946 was greater than in any other year since 1920 and was the third largest annual poundage on record.

The 17-per cent gain over the 1945 consumption resulted from increased sales of permissible explosives and of high explosives other than permissibles which gained respectively 3 and 24 per cent in 1946. The increased sales of permissibles was due in a large part to the sharp gain in use of this type of explosive in the anthracite mines of Pennsylvania. The gain in consumption of high explosives other than permissibles resulted from greatly increased demand for all uses except metal mining in which consumption decreased moderately. Consumption of black powder in 1946 declined slightly from 1945 owing to decreased use of pellet powder which was only partly compensated for by slightly increased consumption of granular black blasting powder.

The coal mining industry in 1946, as in 1945, was the largest consumer of each type of explosive. It alone consumed 45 per cent of all industrial explosives used in the country in 1946. Bituminous-coal mines consumed 34 per cent and anthracite mines 11 per cent of the total 1946 sales of explosives. Of the 240,115,239 pounds used in 1946 to mine coal, 45 per cent were high explosives other than permissible, 41 per cent were permissibles, and 14 per cent were black blasting powder.

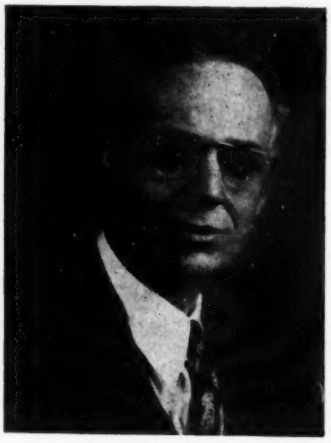
## Emulsion Paints Stage Comeback

Manufacturers' sales of water-thinned paints increased during October after declining for two consecutive months in September and August, according to the Bureau of the Census.

Sales of interior resin emulsion paints totaled 643,717 gallons valued at $1,299,708 compared with September sales of 452,773 gallons valued at $872,279. On a dollar basis, the interior cold-water paints sales amounted to $379,933 in October and $304,394 in September.

The total value of resin emulsion paints and cold-water paints, both interior and exterior types, sold was $1,333,339 and $742,456 respectively. Plastic-texture water paints sales totaled 2,535,328 pounds for $208,535.

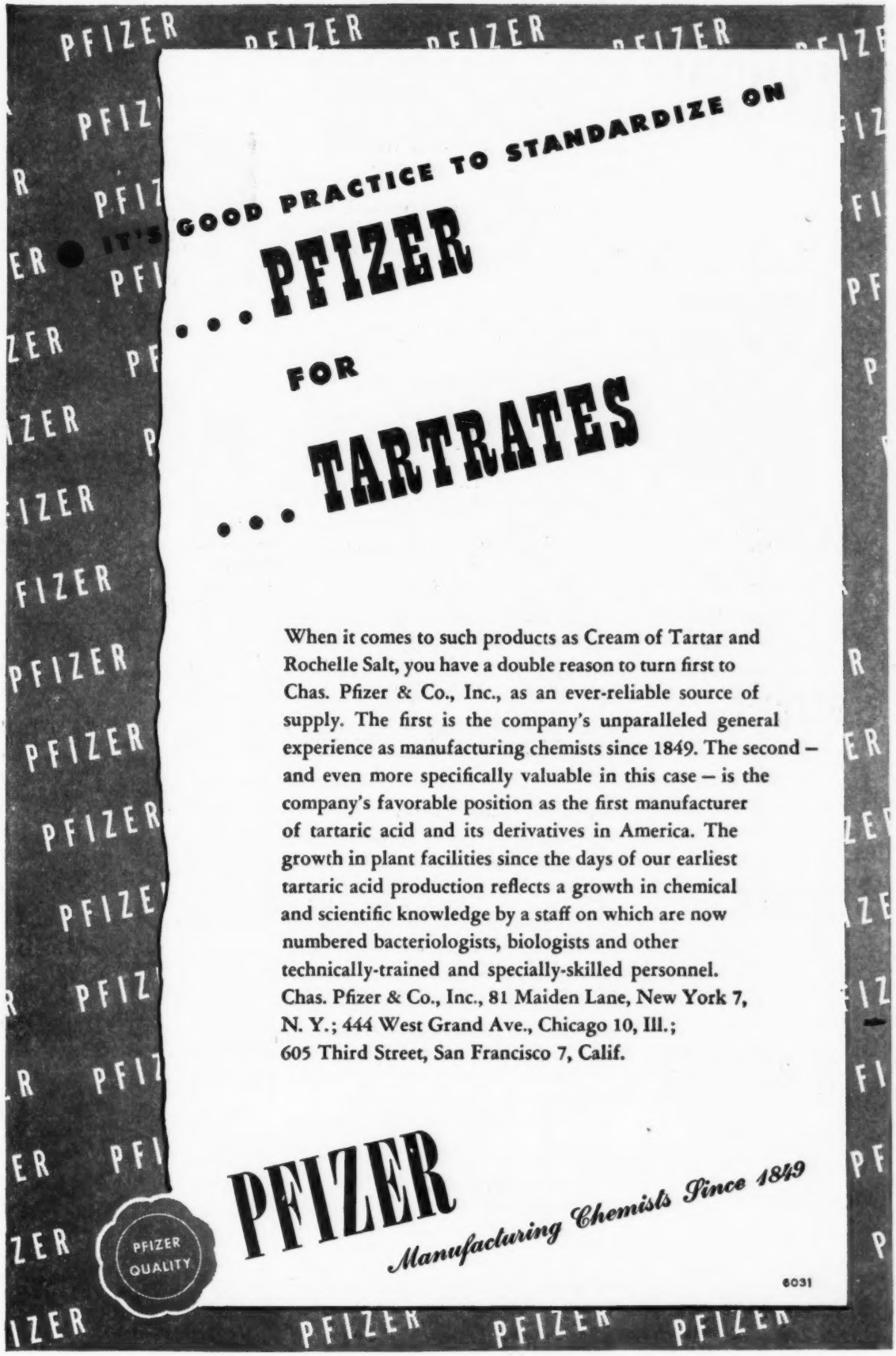
## Rust Engineering Appoints Patterson



***John A. Patterson, named process engineer for The Rust Engineering Co. He will help direct the program of its new process engineering division.***

## Investigate Methods of Applying Insecticides

In recent years several new and better insecticides and fungicides have been developed through research which, in turn, has intensified the need for improved equipment and suitable formulations for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applying these materials to control insects and plant diseases. In an effort to meet this need a research project has been approved under the Research and Marketing Act of 1946, the U. S. Department of Agriculture reports.

The work will be carried on cooperatively by the Bureau of Plant Industry, Soils, and Agricultural Engineering, the Bureau of Entomology and Plant Quarantine, and the Agricultural Experiment Stations of Idaho, Oregon, Washington, and other stations as warranted.

Plans are to initiate these studies in northwestern Oregon where emphasis will be on the development of airplane equipment and satisfactory insecticide formulations to control insects on peas.

## CALENDAR *of* EVENTS

*AMERICAN INSTITUTE OF CHEMICAL ENGINEERS*, regional meeting, Roosevelt Hotel, New Orleans, Feb. 15-19.
*AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS*, Pittsburgh, Pa., Jan. 26-30.
*AMERICAN MANAGEMENT ASSOCIATION*, annual packaging exposition, Public Auditorium, Cleveland, April 26-30.
*AMERICAN OIL CHEMISTS' SOCIETY*, annual meeting, New Orleans, May 4-6.
*ASSOCIATION OF AMERICAN SOAP AND GLYCERINE PRODUCERS*, Waldorf-Astoria, New York, Jan. 28-29.
*COMMERCIAL CHEMICAL DEVELOPMENT ASSOCIATION*, Roosevelt Hotel, Annual Meeting March 9—Technical Session March 10. New York, N. Y.
*COMPRESSED GAS MANUFACTURERS' ASSOCIATION, INC.*, 35th annual meeting, Waldorf-Astoria, New York, Jan. 26-27.
*DRUG, CHEMICAL AND ALLIED TRADES SECTION, N. Y. BOARD OF TRADE*, 22nd annual dinner, Waldorf-Astoria, New York, Mar. 11.
*NATIONAL ASSOCIATION OF CORROSION ENGINEERS*, fourth annual conference and exhibition, Jefferson Hotel, St. Louis, April 5-8.
*NATIONAL PETROLEUM ASSOCIATION*, Cleveland Hotel, Cleveland, April 21-23.

### *Board of Trade Elects*

New directors recently elected by the New York Board of Trade include: B. R. Armour, president, Heyden Chemical Corp.; Stanley I. Clark, vice-president, Sterling Drug, Inc.; James G. Flanagan, secretary and general counsel, S. B. Penick & Co.; Harold C. Green, national accounts representative, L. Sonneborn Sons, Inc.; Clark L. Rodgers, eastern sales manager, Owens-Illinois Glass Co.

Fred J. Stock, vice-president, Chas. Pfizer & Co., Inc., who had been elected during the course of the year, was re-elected for a longer term.

## COMPANIES

THE DU PONT CO. is awarding eighty-one post-graduate and post-doctoral fellowships to forty-seven universities throughout the country for the 1948-49 academic year.

This is an increase of six fellowships, and one university, (Washington University at St. Louis), compared with last year's awards.

Offered for the first time this year are post-graduate fellowships in electrical engineering, at the University of Illinois and Massachusetts Institute of Technology, and in metallurgy, at Lehigh University. The other three new awards are post-graduate fellowships in chemistry at Carnegie Institute of Technology, University of Delaware and Washington University at St. Louis. All the awards made in the preceding year's program are being continued.

### *Sullivan Receives Medal*

***Betty Sullivan will receive the Thomas B. Osborne Medal Award for achievement in cereal chemistry research. She is research director and vice president of the Russell-Miller Milling Co.***

THE SHERWIN-WILLIAMS CO. has recently completed construction of a $750,000 solvent extraction plant at Cleveland, Ohio, to be used for the production of castor oil. A novel, one-step process is employed which reduces processing time from the conventional eight hours to one hour. The company will consume some of its own output of oil, will market a portion to other paint manufacturers.

STANDARD OIL CO. OF CALIFORNIA has completed plans for the immediate construction of a $5 million refinery near Salt Lake City. The new unit, which will serve the inter-mountain area, is scheduled to be operating within the year.

BARADA & PAGE, INC., Kansas City, Mo., distributor of agricultural and heavy chemicals, has opened a new office and warehouse building at Third Ave. and Borich St., Dallas, Texas. The company has also purchased a 60,000 square foot tract at New Orleans, La., and plans construction of a $100,000 office and warehouse on that site.

Pilot plant production of Ortho and Para Dichlorbenzene is now under way at the HEYDEN CHEMICAL CORP. plant in Memphis, Tenn. Full scale production is expected this month.

JOHN W. BOYER and R. L. SEBASTIAN have entered into partnership as consulting engineers. They have opened an office at 1740 K St., N. W., Washington, D. C. Mr. Boyer was formerly chief, Alcohol and Solvents Division, WPB. Mr. Sebastian was chief, Aluminum and Magnesium Division of OPA.

The SHELL OIL CO. has completed a new $1,250,000 research center on Bellaire Blvd., Houston, Texas. It will consolidate all research for exploration and

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# When **Water** must be **"Treated"**

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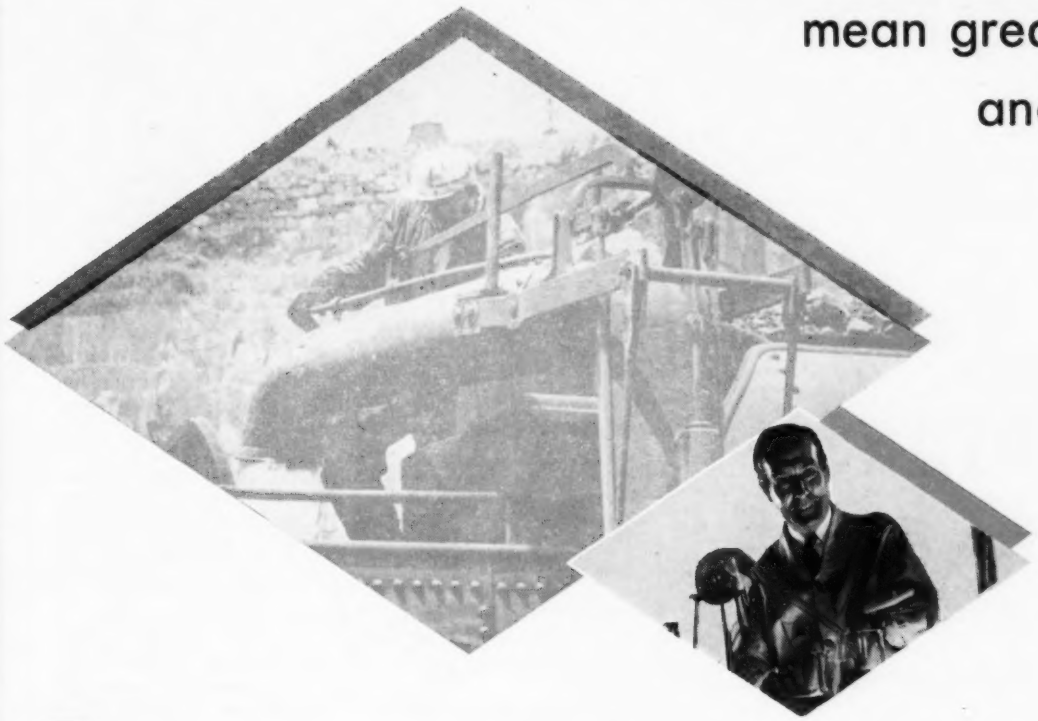

RAW WATER is seldom suitable for large-scale industrial, municipal or process use. Railroads find that the "conditioning" of locomotive boiler water is a necessary precaution for maximum efficiency, economy and long-life of equipment. Municipalities have strict health rules that demand the careful treatment of public water supplies. And where water is used for industrial purposes, proper treatment of boiler or processing water is frequently a "must" for economy and satisfactory results.

Wherever soda ash, caustic soda, chlorine or silicate of soda are called upon to eliminate or neutralize undesirable impurities, the high quality and dependability of Diamond products add assurance of security to the process.

In water treatment as in many other industrial operations, Diamond products are the first choice of experienced users.

DIAMOND ALKALI COMPANY

production activities, including those formerly conducted in The Hague, Netherlands. Dr. Harold Gershinowitz is director of this division.

THE BIORGANIC LABORATORIES, INC. has moved its New York offices and original Brooklyn plant to new quarters, occupying the entire building at 261-263 Norman Avenue, Brooklyn 22, N. Y.

The company has been engaged in the production of hormones, pharmaceutical chemicals, and special intermediates for organic syntheses.

UNITED STATES RUBBER CO. has terminated production at the Government synthetic rubber plant it has operated for the past four and one-half years in Institute, W. Va.

Special grades of GR-S rubber previously produced at Institute, including black types (containing carbon black) and non-staining types, will henceforth be made at the plant operated by U. S. Rubber in Borger, Texas.

All activities formerly conducted by its various manufacturing and sales subsidiaries will be taken over by the parent CELANESE CORP. OF AMERICA. The subsidiaries affected are: CELANESE CO., INC.; CELANESE PLASTICS CORP.; CELANESE CHEMICAL CORP.; CELANESE EXPORT CORP.; TUBIZE, INC.; STAUNTON TEXTILE CORP. and BRIDGEWATER TEXTILE CORP.

The WESTERN DIVISION of MONSANTO CHEMICAL CO. will install a small plant at Decatur, Ill., moving to that city a portion of the company's Portsmouth, Va., operation which manufactures glues and adhesives.

Detroit district sales office of SHARP & DOHME, INC., which has been operating under the supervision of the Columbus, Ohio, office, discontinued operations on November 26 and its complete stock has been moved to the new Columbus headquarters at 226 East Sycamore Street.

The S. P. RECLAIMING CO., 3540 Emery St., Los Angeles, Calif., has changed its name to Oil and Solvent Process Co.

The WITCO CHEMICAL CO. has started construction of an asphalt processing refinery in Perth Amboy, N. J. It will be in operation by mid-1948.

The plant site has already been graded, a railroad siding constructed, and roads, retaining walls, and water and sewer lines have been installed.

## *Southern Alkali Appoints Weeks*

***Charles E. Weeks, new assistant to the operating vice-president, Southern Alkali Corp. Mr. Weeks has been associated with the firm since 1934.***

GIVAUDAN-DELAWANNA, INC., New York, has formed the Sindar Corporation, a separate company that has been established to take over the activities formerly carried out by the Industrial Products Division of Givaudan-Delawanna, Inc.

A two-story and basement building at 34 E. Logan Street, Philadelphia, has been purchased by Leeds & Northrup Co., manufacturers of electrical measuring instruments and automatic controls.

Commercial production of pentaerythritol and related chemicals has been started by a new company, DELAWARE CHEMICALS, INC., which has its main office and plant in Wilmington, Delaware.

R. W. GREEFF & CO., INC., New York, is sales agent for the new firm.

THE DAVIES NITRATE CO., INC., manufacturer and distributor of industrial chemicals, 114 Liberty Street, New York City, has purchased a 55 acre plant site in Raritan Township, New Jersey.

It will utilize this property for manufacturing, compounding and warehousing industrial chemicals together with its wholly owned subsidiary, Croton Chemical Corporation. Construction will start at once.

KOPPERS CO., INC., has acquired all stock of the Manufacturers Chemical Corp. and its sales subsidiary, the Chemaco Corporation, both of Berkeley Heights, N. J.

Plans for construction of a new manufacturing unit to produce large quantities of polyethylene polysulfide (p. e. p. s.) are being finalized by B. F. Goodrich Chemical Co. The new unit will be installed in the chemical company's plant in Akron.


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★ *Iodine* U.S.P.

★ *Potassium Iodide* U.S.P.

★ *Feeding Mixtures*

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TRUESDAIL LABORATORIES, INC., formerly located at 520 West Avenue 26, Los Angeles, has just moved to its own building at the corner of North Figueroa Street and West Avenue 41, according to Roger W. Truesdail, president.

THE MICRONIZER CO., subsidiary of Freeport Sulphur Co., has purchased 30 acres of land at Belle Chasse near New Orleans and is considering constructing a plant there for grinding sulphur and other materials, according to Maurice F. Dufour, vice-president and general manager.

PUBLICKER ALCOHOL and CHEMICAL SALES CORP. has appointed the COMMERCE PETROLEUM COMPANY, 2923 Lock Street, Chicago, as a distributor in metropolitan Chicago for its complete line of alcohols and chemicals.

### *Battelle Names Sibbett*

***Morgan Sibbett, appointed to the technical staff of Battelle Memorial Institute to assist in making economic appraisals of new engineering developments.***

## PERSONNEL

### *Company Officers*

FRED GROSIUS and T. K. HAVEN have been named directors of Reichhold Chemicals, Inc. H. W. MASON, JR., and E. A. TERRAY have been elected vice-presidents.

GEORGE N. VITT, formerly assistant to the president, A. F. Holden Co., has joined John Ek Industries, Inc., Guilford, Conn., as manager and a member of the board of directors. The Crown Chemical Division of the Ek organization will produce heat-treating salt baths, etc.

EARL B. PUTT and ALFRED S. MOSES have been elected president and vice-president, respectively, of Seil, Putt & Rusby, Inc., New York. HARVEY A. SEIL, one of the founders of the firm of analytical chemists, has retired.

SAMUEL MAIRS, formerly executive vice-president of Archer-Daniels-Midland Company, is now chairman of the board. T. L. DANIELS, executive vice-president, has been elected president.

J. W. MCCOY has retired as a vice-president and member of the Executive Committee of E. I. du Pont de Nemours & Company. He will continue to serve

# CELANESE

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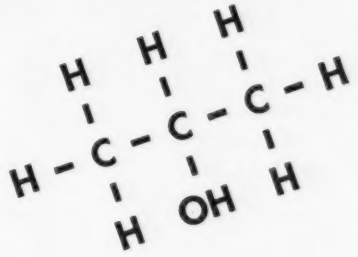

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In order to serve increasing industrial demands, the Chemical Division of Celanese Corporation of America is offering increased quantities of iso-Propyl Alcohol. Celanese iso-Propyl is now available in tank car quantities from the Chemcel Plant at Bishop, Texas. It is a Technical Grade alcohol possessing an exceptionally pleasant odor. This unusual characteristic suggests wide application as a chemical intermediate, solvent, extractant, diluent and for conversion to its respective esters. Its unusually low temperature characteristics are currently expanding its use as an anti-freeze.

This addition to the growing line of Celanese* organic chemicals is another step in the progressive chemical program of Celanese Corporation of America. As a pioneer in producing organic chemicals from petroleum gases, Celanese is in an advantageous position, through advanced research and the most modern production facilities, to meet critical chemical needs. For information on Celanese organics, and for technical assistance in their application, write:

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## GLYCOL

**2-METHYL-1, 3-PENTANEDIOL**

**Combining solvent, lubricating and penetrating properties.**

**Containing one primary and one secondary hydroxy group, Celanese Methyl Pentanediol has unusual solubility for a wide variety of resins, and is miscible with most common organic solvents. Its high boiling point (215°C) plus complete miscibility with water give it a combination of properties not found in any other glycol now in use.**

**Call on Celanese for technical assistance and information regarding the application of Methyl Pentanediol in your field. Our Field Technicians and Research Facilities are always at your service.**

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Horizontal or vertical air flow, with the ultra-efficient Moore "Lifetime" Fans. No gears, no belts, no couplings, no corrosion problems. Heavy-duty All-Monel pressure blowers, trouble-free under most severe conditions. Slow-speed, ball bearing, direct drive motor is IN the hub. Other advanced and thoroughly proved mechanical and structural features throughout.
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Standard spray towers or with coil systems in base, with or without basins or internal decks. Low pressure water distribution. Bolted assembly of Redwood or All-Metal, shipped complete.
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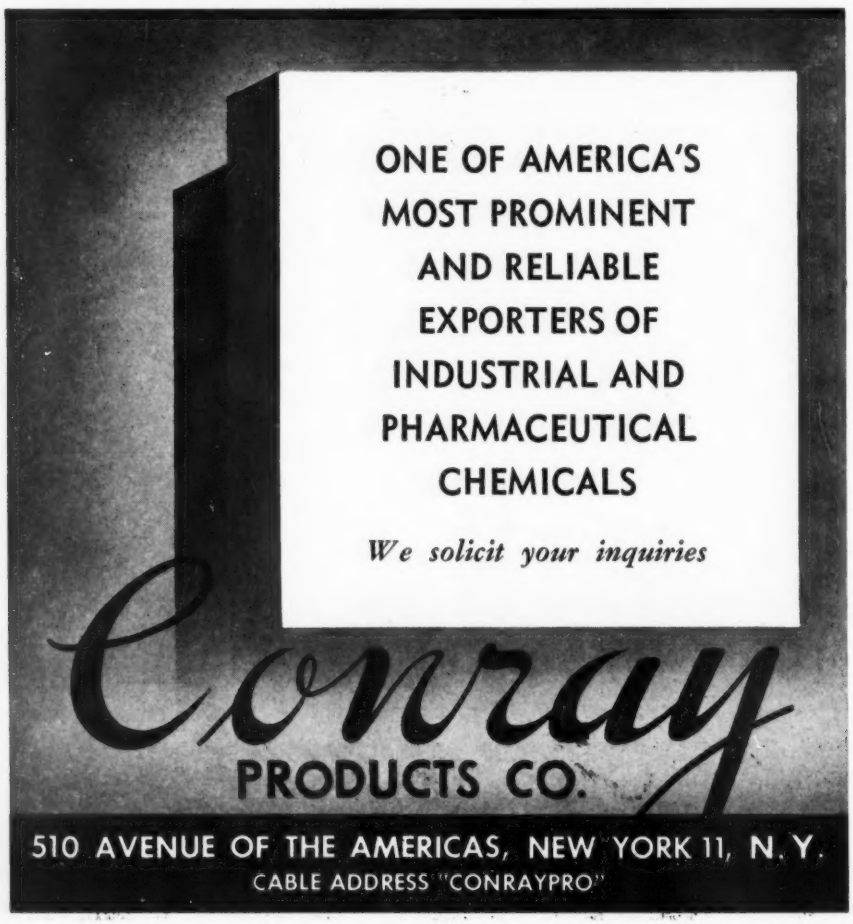



as a director. WILLIAM H. WARD, general manager of the company's Explosives Department, has been elected a director, vice-president, and member of the Executive Committee.

The Shepard Chemical Corp., New York, has appointed HARRY W. LANG vice-president in charge of export. He previously operated his own export chemical business.

FRANCIS J. REID has been elected executive vice-president of the New York Quinine & Chemical Works, Inc.

J. W. H. RANDALL, formerly director of research, New York Quinine & Chemical Works, has resigned as of Jan. 1. Dr. Randall will maintain consulting offices at 50 E. 41st St., New York.

### *Wathey Joins Bocon*

***John B. Wathey, elected vice president in charge of research and development, the Bocon Chemical Corp. He was formerly with Wilbert Products Co.***

### *Production*

ROBERT O. BODEN has been appointed development director for Pittsburgh Plate Glass Co. He will assist the management of the firm's 27 glass, paint and chemical producing plants in the establishment of programs directed toward training and maximum individual development of personnel.

ROGER C. SONNEMANN has been appointed industrial relations director for the Monsanto Chemical Co. plant in Everett, Mass.

VANCE N. WILSON has been appointed safety co-ordinator for the Pennsylvania Salt Manufacturing Co.

HAROLD W. JOHNSON has joined Walter Kidde Constructors, Inc., New York City, as chemical engineer in connection with the design and construction of chemical plants. He was formerly with American Cyanamid Co. and B. F. Goodrich Chemical Co.

### *Research*

Witco Chemical Company has appointed JOHN H. LUX as director of research on asphaltic specialties at its Chicago Research Laboratory. He was formerly with the Neville Co., Pittsburgh, and Carbide and Carbon Chemical Corp., South Charleston.

# Investigate Cowles DRYMET*

**DRYMET** is commercial anhydrous sodium metasilicate. DRYMET contains no water—combined or uncombined. It is the most highly concentrated form of metasilicate on the market.

**DRYMET** yields more chemical value per pound than other detergent silicates —and it is priced to yield more chemical value per dollar.

**DRYMET** is readily soluble in all practical concentrations at all practical temperatures.

**DRYMET** has a total alkalinity as $Na_2O$ of not less than 50%.

**DRYMET** yields a pH of 11.55 in a .06% solution. DRYMET will improve the detergent efficiency of practically every alkaline solution.

Write for DRYMET File Folder containing complete technical information and suggested formulations.

***DRYMET** is available for immediate shipment.*

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MICROCRYSTALLINE
WAXES
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CERESINES
WHITE, YELLOW, BLACK
*Full Range of Melting Points*

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*Crude and Refined*

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CRYSTAL · GRANULATED · POWDERED
IMPALPABLE · ANHYDROUS

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51 MADISON AVENUE, NEW YORK 10, N.Y. · CHICAGO 16 · LOS ANGELES 14

General Aniline & Film Corp. has made the following changes and promotions at its Central Research Laboratory, Easton, Pa.

DONALD L. FULLER, CARL BARNES and FRITZ MAX have been promoted to the office of associate directors of the Research Laboratory.

W. W. WILLIAMS has been transferred from the Rensselaer dyestuff plant to the Central Research Laboratory as the Azo Dye Section leader.

JOHN COPENHAVER and CLYDE MCKINLEY have been promoted to section leaders in the New Products Department.

JOHN R. BOWMAN has been appointed chief of the recently formed department of research in physical chemistry, Mellon Institute, Pittsburgh. He has been an Institute member since 1935.

FRANK J. SODAY has been appointed director of research, Lion Oil Co. The company plans a major expansion of its petrochemical research activities, under the direction of Dr. Soday.

Recent additions to the research staff of Commercial Solvents Corp., Terre Haute, Ind., include: OHMER G. WEGRICH, MARVIN C. BACHMAN, RICHARD E. RAY, and WALLACE L. OTT. DAVID L. NICOL, JR., has joined CSC's Sterlington, La., staff.

J. ELSTON AHLBERG has joined the research staff of the Davison Chemical Corp., Baltimore, Maryland. During the past eleven years he was associated with the Universal Oil Products Company, Chicago, Illinois, and has specialized in the development of cracking catalysts.

Three new staff members have been appointed to the technical staff of the Midwest Research Institute, Kansas City, Missouri. They are: WILLIAM A. JAMES, Columbus, Ohio; ROMAINE EDWIN JOHNSON, and GOLDENA F. PAYNE.

ARTHUR P. TANBERG, dean of the Du Pont Co.'s laboratory directors, retired last month. Since 1946, Dr. Tanberg has been the administrative director of the Chemical Department.

ROBERT A. EWING and SEYMOUR CALVERT have joined the staff of Battelle Institute, Columbus, Ohio. Mr. Ewing will be engaged in chemical engineering and Mr. Calvert will be engaged in research in organic chemistry.

### *Sales*

HOWARD A. MARPLE, formerly editor of Monsanto Magazine, has been appointed director of the newly created department of advertising at Monsanto Chemical Co.

EDMUND GREENE has been appointed sales promotion and advertising manager of the Merrimac Division of Monsanto Chemical Co.

WILLIAM J. HENNESSY has been named Pittsburgh district sales manager for the Special Chemicals Div. of the Pennsylvania Salt Manufacturing Co.

RUSSELL A. KABERG, formerly with Monsanto Chemical Co., has joined Wyandotte Chemicals Corp. as field representative specializing in organic chemicals.

FRANKLIN T. PETERS has joined Glyco Products Co., Inc. as technical service representative for northern New Jersey. Dr. Peters was previously associated with the Barrett Co. and E. I. du Pont de Nemours, Inc.

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# CHEMICAL SPECIALTIES

*A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.*

## *Monsanto Schedules Adhesives Unit*

The Western Division of Monsanto Chemical Co. plans to install a small plant at Decatur, Ill., moving to that city a portion of the company's Portsmouth, Va., operation which manufactures glues and adhesives.

At the present time it is impossible to state when operations at the new plant will begin, but it will not be before July 1, 1948.

## *Stallcup to Manage Glidden Naval Stores*

***W. David Stallcup, chosen manager of the naval stores division, the Glidden Co. He will direct operation of naval stores plants at Jacksonville and at Valdosta, Georgia.***

## *Study Floor Cleaning Compounds*

Terrazzo, a flooring consisting of polished small marble chips set in cement, has gained wide use in the building industry for decorative floors. And, in order to determine the reaction of commonly used cleaning preparations on terrazzo, the National Bureau of Standards has undertaken a study of several of the active ingredients. Although the investigation has not yet been completed some of the results can now be reported.

Commercial cleaning compounds usually consist of one or more soluble ingredients such as soda ash, trisodium phosphate, soap or syntheitc sulfonate, with abrasives often forming a large part of the mixture. It is well known that many salts when carried into a porous material may crystallize within the pores and cause disintegration. For this reason the action of soda ash and trisodium phosphate on terrazzo has been given particular attention.

For the experiments, disc-shaped specimens of terrazzo were made from the usual mixture of 1 part portland cement and 2 parts marble chips and ground in the form of dishes with a specially constructed jig. Seventy-six varieties of marble chips were used in order to obtain comparative data on the different products. After the specimens were carefully cured and aged for six months they were divided into identical groups for the simulated cleaning tests.

Among the observations:

1. Specimens treated with soda ash failed before those on which trisodium phosphate was used. Deterioration occurred mainly in the cement matrix. It is regarded as probable that the TSP has a less severe crystallizing action than the stronger alkali.
2. Some marble aggregates scaled, spalled, or cracked, with a consequent loss of color value.
3. A synthetic sulfonate did not appear to affect the terrazzo.

The strengths of solutions used in the investigation were those commonly used in scrubbing floors, but more solution was used, and test samples were oven-dried—which would yield favorable conditions for crystallization. Thus, although the detergents can be compared, no definite time-deterioration factor can be so established.

## *New Organization Acquires Socony Specialties*

Socony-Vacuum Oil Company, Inc., has discontinued manufacturing and marketing many of its products which have been sold under the trade names Tavern, Bug-a-boo and Sanilac.

Products to be discontinued include household waxes, cleaners, insecticides for the home and farm, and similar products for commercial use.

The rights to manufacture and distribute Socony-Vacuum's Bug-a-boo line has been purchased by Bug-a-boo Products, Inc., Dover, N. H., a new company.

## *Borden Markets Household Adhesive*

National distribution is expected shortly for Cascorez, a new household glue manufactured by the Casein Company of America, Division of The Borden Company.

Cascorez is a polyvinyl resin glue, is said to be as strong as other liquid glues, but as clean as library paste. Although opaque white when spread, it is transparent when dry. For this reason it is particularly adaptable not only for gluing but as a protective coating for labels in home canning and other uses.

It is being distributed through hardware and household supply stores.

## *Describes Pyrethrin-Containing Mosquito Repellent*

The work of C. G. Johnson on mosquito repellents is noteworthy for the careful controls used for evaluating various products of this kind. In the *Journal of Tropical Medicine* (50:52, 1947), he reports that citronella cream, containing 28 per cent of citronella oil in a base consisting of hard and soft paraffin proved useless, as did 1 per cent of pyrethrin in the same base.

With a tragacanth-glycerine base containing the same proportion of pyrethrin, much better results were obtained; protection lasting up to seven hours being provided. The following formula was used to make a paste which, on shaking with sufficient water to give 200 Gm, produces a cream that was quite pleasant to use:

| | |
|---|---|
| Pyrethrin extract (40% pyrethrins, colorless concentrate) | 5 cc. |
| Denatured alcohol | 10 cc. |
| Tragacanth | 6 Gm. |
| Glycerine | 6 Gm. |

## *Archer-Daniels-Midland Elects Sorenson*

***Samuel O. Sorenson, made vice-president in charge of research, Archer-Daniels-Midland Co. He will supervise the activities of the ADM laboratory, which is devoted to the study of vegetable oils and allied products.***

## *Herbicide Favors Strong Root Structure*

Soil treatment with 2,4-D may not only eliminate cultivation of corn, but may provide a stronger, better anchored corn plant, according to Michigan State college horticulturists.

Scientists base their statements on experiments with sweet corn concluded at East Lansing during the past summer.

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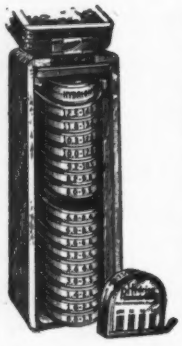

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According to a report by Dr. C. L. Hamner, Dr. H. B. Tukey and R. F. Carlson, MSC horticulturists, corn planted on plots treated with 2,4-D withstood a heavy wind when plots on untreated soil suffered damage.

Golden Seneca sweet corn was planted in rows four feet apart and drilled about two inches into the soil. Immediately after planting, a 70 per cent preparation of the sodium salt of 2, 4-D was applied to the soil surface with a knapsack sprayer at the rate of 5, 10 and 20 pounds per acre. The fan-type nozzle used permitted more rapid and even distribution of the chemical than would a cone-shaped nozzle.

With a cool and wet early summer, and a warm, dry mid-summer, weed control was effective with 5 pounds of 2, 4-D per acre. Growth, yield, and quality of corn were not affected. With larger amounts of the chemical, however, there was some retardation of growth of the corn.

### *Metal Polish Formulas*

The following formulas for silver polishes were cited recently by J. M. Vallance in the Manufacturing Chemist:

| | |
|---|---|
| Hard soap | 14.0 parts |
| Diatomaceous earth | 35.0 " |
| Sodium carbonate | 0.5 part |
| Trisodium phosphate | 0.5 " |
| Glycerine | 10.0 parts |
| Water | 40.0 " |

A liquid silver polish may be made along the following lines:

| | |
|---|---|
| Oleic acid | 4.0 parts |
| Ammonia (26°Be.) | 2.7 " |
| Glycerine | 5.0 " |
| Safrole | 0.5 part |
| Kieselguhr | 12.5 parts |
| Colloidal kaolin | 1.0 part |
| Potassium carbonate | 0.3 " |
| Water | 63.5 parts |
| Red dye | sufficient |

### *Indexed Detergent Data Compiled*

A novel card index file, covering 534 synthetic detergents, has been compiled recently by John W. McCutcheon, consulting chemist, 475 Fifth Ave., New York.

All cards are standard keysort, punched 5 x 8 inches in size. Each is punched for serial number, manufacturer, and the first three letters of the tradename. Such other information as is available (form, type, principal uses, per cent active ingredient, chemical constitution, price, uH, surface tension, stability, etc.) is also classified.

The file, as presently constituted, is sold as a complete unit, including metal file case, punch, sorting needle and explanatory code index. Sale price includes maintenance of the file for a period of one year.

### *Introduce Waterless Hand Cleaner*

A new product, tradenamed Far Waterless Handy Cleaner, is now being introduced by the Farbach Chemical Co., Cincinnati, Ohio.

The specialty is claimed to be stable, will not turn rancid, harden, or form mold. It is white in color, and contains lanolin as one of its essential ingredients.

At present the company is packing the cleaner in 14 oz., 3 lb. and 5 lb. containers. Distribution is being handled through Henderson & Austin Co., Stamford, Conn.

### *Marietta Acquires Another Subsidiary*

American-Marietta Co., Chicago, has purchased Lac Chemicals, Inc., Culver City, Calif. The new acquisition is engaged in distilling, warehousing and selling industrial alcohol and proprietary solvents, and has a capacity of 2,500,000 wine gallons per year.

American-Marietta plans to expand its production to include other chemicals.

### *Promote Mercuric Seed Disinfectant*

A dry seed disinfectant that is practically odorless and, when properly handled, reduces the hazard of irritation to the skin of persons using it has been developed by the Du Pont Co.

Tradenamed Ceresan M seed disinfectant, it is being recommended for use against numerous seed-borne and soil-borne crop diseases, including seed-borne anthracnose, angular leafspot, seed decay, and seedling damping-off of cotton.

The active ingredient of this new material is ethyl mercury p-toluene sulfonanilide, tested by state agricultural experiment stations under the temporary designation of #1452-F.

### *Horn Promotes Fume-Resistant Paint*

A novel, fume-resisting enamel, is now being marketed under the tradename, Fumex, by A. C. Horn Co., Inc., Long Island City, N. Y.

According to the maker, the product, listed as a "polymerized thermoplastic elastomer produced from an olefinic base" is resistant to alkali, acid, and sulphide fumes.

It is recommended for use on brick, concrete, or wood surfaces. Supplied in brushing consistency, white is the only color available to date.

### *Market Anti-Corrosion Finish*

A new anti-corrosive co-polymer finish for the protection of metal, wood and concrete against corrosion from exposure to moisture, acids, alkalies has been developed by Industrial P-5 Division, The Watson-Standard Co., Pittsburgh, Pa.

In addition to chemical resistance, P-5 is said to be free from objectionable paint odors, is non-toxic and dries by evaporation without requiring an oxidation period. It has good thermal stability, is resistant to abrasion and scrubbing and has good aging characteristics.

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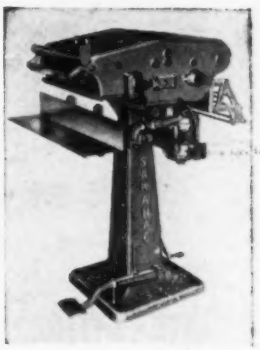

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# CHEMICAL MARKETS

## *Rubber Use at New Peak*

Consumption of rubber for the first nine months of 1947 stood at 828,569 long tons. This was 10.4 per cent above the record 750,390 long tons used in the same period last year. At the same time consumption of reclaimed rubber advanced 6.1 per cent over 1946 to 213,018 long tons for the nine-month period.

Use of American-made rubber was in excess of natural rubber consumption for the period. American-made rubber use totaled 431,589 long tons, as against 396,980 long tons for natural.

## *Production of Inorganics Pared*

United States production of inorganic chemicals in September maintained a high level but declined slightly in comparison with August, according to the Bureau of the Census. Results of the continuous monthly survey of 35 industrial chemicals conducted by the Bureau show that the national output of 27 was greater this September than in the corresponding month a year ago. However, the September production of 22 of the 35 chemicals was less than in August.

The lowest production total for any month of the current year was recorded for synthetic anhydrous ammonia, ammonium nitrate solution, and nitric acid but the month's output of these materials was well above that of a year ago.

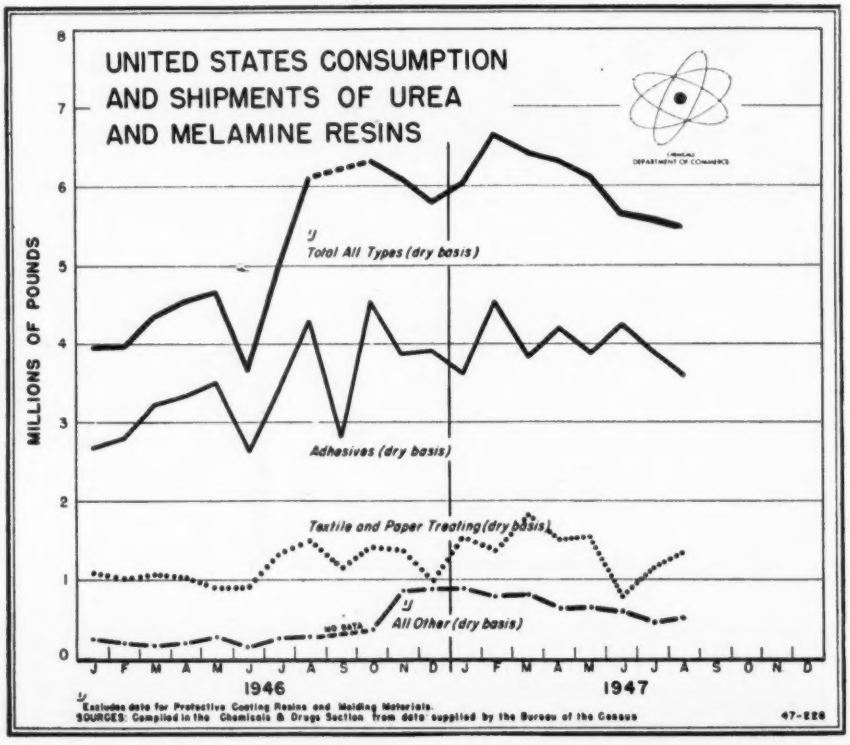
Compounds showing a lower production in September than in August but above other months of this year and September of last year include chlorine, hydrochloric acid, phosphoric acid, soda ash, caustic soda, salt cake and sulfuric acid.

The production of carbon dioxide (liquid and gas) fell after rising steadily since last February. Oxygen production also declined but hydrogen output continued upward to approximate the 1944-45 levels. Production of the chromium chemicals and chrome pigments, except zinc chromate, showed slight gains.

## *Fertilizer Makers Shoot for New Record*

Even though U. S. output of fertilizer chemicals has nearly doubled prewar tonnage the supply of such materials to be made available to domestic consumers during this fertilizer year will fall short of the nation's agricultural requirements. For, according to the U. S. Department of Agriculture, although 4 per cent more nitrogen, 5 per cent more potash, and 6 per cent more phosphate will be produced, total output will still remain below demand. Of the three basic components, potash and nitrogen are expected to be in the "tight" category; phosphate supplies will more closely approximate the present needs.

Present estimates are that about 816,000 short tons of commercial nitrogen will be available, compared with 785,000 tons consumed in the previous period. Potash supplies are estimated to reach 900,000 tons of $K_2O$, up over the previous 854,000 tons. Phosphates will move up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AND MELAMINE RESINS
MILLIONS OF POUNDS
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Textile and Paper Treating (dry basis)
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1946
1947
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SOURCES: Compiled in the Chemicals & Drugs Section from data supplied by the Bureau of the Census
47-228

to 1,850,000 tons ($P_2O_5$) versus 1,754,000 tons last year.

Naturally, since 1947 tonnages in each case represented record levels, the quantities anticipated for this year will establish new tonnage peaks. Incidentally, the major increase in nitrogen will be in the form of solutions, with solid forms calculated to approximate previous tonnages. At present, solutions represent a little more than a third of the total.

The U. S. is scheduled to export some 61,000 tons of nitrogen to twenty foreign countries. Net imports will be about 120,000 tons—roughly equal to 1947. Imports from Canada, however, will be pared, principally in the calcium cyanamide category.

### *Bauxite Output Dips, Imports Gain*

Domestic production of bauxite again declined in the third quarter of 1947, continuing the downward trend indicated in the second quarter, according to the Bureau of Mines. However, imports of bauxite during the quarter established an all-time record, and importation during the first three quarters was at an annual rate approximately 11 per cent greater than in the previous record year, 1943.

Production totaled 336,445 long tons (285,978 tons dried equivalent) during the third quarter, or 6 per cent less than that in the preceding quarter. Arkansas furnished the greater portion of third-quarter out-put (94 per cent) and the remainder was from Alabama and Georgia.

Total imports of bauxite in the third quarter were 509,577 long tons, an increase of only 3 per cent over the preceding quarter, but a new record. As in the past, Surinam was the principal source of imports, but shipments from the Netherlands Indies increased. Imports from British Guiana, which had totaled 82,419 tons in the first quarter, dwindled to 2,700 tons in the third, and it was evident that increasingly substantial shipments of bauxite from that country to Canada were being made.

### *Carbon Black Registers Modest Gain*

Production, shipments and producers' furnace types of carbon black showed moderate increases during the month of October while exports showed sharp declines, according to Bureau of Mines' estimates.

Production of contact and furnace blacks totaled 113,921,000 lbs. in October compared to a September figure of 112,199,000 lbs. Shipments rose from 100,295,000 lbs. to 109,505,000 lbs. Producers' stocks amounted to 61,256,000 lbs. at the end of the month compared to 56,840,000 lbs. at the end of September.

Exports during the month, however, declined from 32,470,000 lbs. in September to 20,625,000 lbs. in October.


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**INDRAWET is multi-functional. As wetting agent, penetrant, detergent, foaming agent and surface-tension depressant, it is used in:**

| | |
|---|---|
| Automobile Washes | Household Cleaners |
| Commercial Laundries | Industrial Cleaners |
| Dairy Cleaning | Insecticides |
| Fire Extinguishers | Ore Flotation |
| Food Processing | Pulp Processing |
| Herbicides | Textile Processing |

***Write for latest technical bulletin and samples for testing.***

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manufacturing and research chemists

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wetting agents emulsifiers penetrants
foamers dispersants softeners
detergents defoamers sequestrants
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# CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

*Purchasing Power of the Dollar: 1926 Average—$1.00*
*December, 1945, $0.864 December, 1946, $0.767*
*December, 1947, $0.601*

| | Current | | 1947 | | 1946 | |
|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High |
| Acetaldehyde, 99%, drs wks..lb. | .11 | .12 | .11 | .15 | .11 | .14 |
| Acetic Anhydride, drs.....lb. | .13 | .14½ | .11½ | .14½ | .11½ | .13 |
| Acetone, tks, delv.....lb. | .07 | .09 | .07 | .10 | .06 | .07 |
| **ACIDS** | | | | | | |
| Acetic, 28% bbls.....100 lbs. | 3.78 | 4.08 | 3.38 | 4.08 | 3.38 | 3.63 |
| Glacial bbls...100 lbs. | 10.65 | 10.90 | 9.15 | 10.90 | 9.15 | 9.40 |
| drs, wks.....100 lbs. | 13.20 | 14.00 | 6.93 | 14.00 | 6.93 | 7.25 |
| Acetylsalicylic, Standard USP.....lb. | .45 | .59 | .45 | .59 | .40 | .59 |
| Benzoic, tech, bbls.....lb. | .43 | .47 | .43 | .47 | .43 | .47 |
| USP, bbls, 4,000 lbs. up...lb. | .... | .54 | .... | .54 | .... | .54 |
| Boric tech, bbls, c-l.....tons *a* | .... | 137.50 | .... | 137.50 | .... | 109.00 |
| Chlorosulfonic, drs, wks.....lb. | .03 | .04½ | .03 | .04½ | .03 | .04½ |
| Citric, USP, crys, gran, bbls.....lb. *b* | .22 | .23 | .20 | .23 | .20 | .21 |
| Cresylic 50%, 210-215° HB, drs, wks, frt, equal.....gal. | .... | 1.26 | 1.01 | 1.26 | .81 | 1.04 |
| Formic, 85%-90% cbys.....lb. | .12 | .14½ | .10 | .14½ | .10 | .13 |
| Hydrofluoric, 30% rubber, drs.....lbs. | .08 | .09 | .08 | .09 | .08 | .09 |
| Lactic, 22%, lgt, bbls, wks..lb. | .44 | .48 | .039 | .0415 | .039 | .0415 |
| 44%, light, bbls, wks.....lb. | .815 | .855 | .073 | .855 | .073 | .0755 |
| Maleic, Anhydride, drs.....lb. | .25 | .26 | .25 | .26 | .25 | .26 |
| Muriatic 18° cbys.....100 lbs. | 1.50 | 2.90 | 1.50 | 2.90 | 1.50 | 2.45 |
| 20° cbys, c-l, wks....100 lbs. | 1.85 | 2.00 | 1.85 | 2.00 | .... | 1.75 |
| 22° cbys, c-l, wks....100 lbs. | 2.35 | 2.50 | 2.35 | 2.50 | .... | 6.00 |
| Nitric, 36°, cbys, wks..100 lbs. *c* | 5.00 | 6 30 | 5.00 | 6.30 | 5.00 | 5.25 |
| 38°, c-l, cbys, wks...100 lbs. *c* | 2.35 | 5 50 | .... | 5.50 | .... | 5.50 |
| 40°, c-l, cbys, wks...100 lbs. *c* | 6.00 | 6.50 | .... | 6.50 | .... | 6.00 |
| 42°, c-l, cbys, wks...100 lbs. *c* | 6.50 | 7.00 | .... | 7.00 | .... | 6.50 |
| Oxalic, bbls, wks.....lb. | .13 | .14 | .11¾ | .14 | .11¾ | .14½ |
| Phosphoric, 100 lb. cbys, USP.....lb. | .10½ | .13 | .10½ | .13 | .10½ | .13 |
| Salicylic tech, bbls.....lb. | .31 | .38 | .26 | .42 | .26 | .42 |
| Sulfuric, 60°, tks, wks.....ton | 13.00 | 13.50 | .... | 13.50 | .... | 13.00 |
| 66°, tks, wks.....ton | 16.50 | 17.50 | .... | 17.50 | .... | 16.50 |
| Fuming 20% tks, wks....ton | 19.50 | 20.50 | .... | 20.50 | .... | 19.50 |
| Tartaric, USP, bbls.....lb. | .49½ | .50 | .49½ | .55 | .54½ | .71 |
| Alcohol, Amyl (from Pentane) tks, delv.....lb. | .... | .25 | .... | .25 | .... | .131 |
| Butyl, normal, syn, tks...lb. | .... | .17 | .... | .17 | .... | .14½ |
| Denatured, CD 14, c-l drs.....gal. *d* | 1.03 | 1.04½ | 1.03 | 1.06 | .... | .90 |
| Denatured, SD, No. 1, tks. *d* | .... | .98 | .... | .98½ | .... | .82½ |
| Ethyl, 190 proof tks.....gal. | 18.04 | 18.08 | 18.04 | 18.08 | .... | 17.94 |
| Isobutyl, ref'd, drs.....lb. | .... | .13 | .... | .13 | .... | .0866 |
| Isopropyl ref'd, 91%, dms.....gal. | .44 | .47½ | .41 | .50½ | .38 | .47 |
| Alum, ammonia, lump, bbls, wks.....100 lbs. | .... | 4.25 | .... | 4.25 | .... | 4.25 |
| Aluminum, 98.99%....100 lbs. | 15.00 | 16.00 | 15.00 | 16.00 | 15.00 | 16.00 |
| Chloride anhyd, l.c.l. wks..lb. | .... | .10¾ | .... | .10¾ | .09 | .12 |
| Hydrate, light, bgs.....lb. | .... | .17 | .... | .17 | .... | .14½ |
| Sulfate, com'l. bgs, wks, c-l.....100 lbs. | 1.15 | 1.30 | 1.15 | 1.30 | 1.15 | 1.25 |
| Sulfate, iron-free, bgs, wks .....100 lbs. | 1.95 | 2.25 | 1.75 | 2.50 | 1.75 | 2.00 |
| Ammonia anhyd. cyl.....lb. | .16 | .... | .14½ | .20 | .... | .14½ |
| Ammonia, anhyd, fert, tank cars, wks, frt. equalized...ton | .... | 59.00 | .... | 59.00 | .... | 59.00 |
| Ammonium Carbonate, USP, lumps, drs.....lb. | .08¾ | .19 | .08¾ | .19 | .08¾ | .09½ |
| Chloride, whi, bbls, wks, 100 lbs. | 4.75 | 5.00 | 4.45 | 5.15 | 4.45 | 5.15 |
| Nitrate, tech, bgs, wks....lb. | .0435 | .0450 | .0435 | .0450 | 0.435 | .0850 |
| Oxalate pure, grn, bbls....lb. | .23 | .29 | .23 | .29 | .... | .23 |
| Perchlorate, kgs.....lb. | .25 | .... | .24 | .25 | no stocks | |
| Phosphate, dibasic tech, bgs.....lb. | .07 | .07¾ | .07 | .07¾ | .07 | .07¾ |
| Stearate, anhyd, drs.....lb. | .... | .34 | .... | .34 | .... | .34 |
| Sulfate, drs, bulk.....ton | 30.00 | 38.00 | 30.00 | 38.00 | 28.20 | 30.00 |
| Amyl Acetate (from pentane) tks, delv.....lb. | .21 | .24 | .21 | .24 | .... | .181 |
| Aniline, Oil, drs.....lb. | .13 | .14 | .12 | .14 | .14½ | .13 |
| Anthraquinone, sub, bbls....lb. | .... | .70 | .... | .70 | .... | .70 |
| Antimony Oxide, bgs.....lb. | .26 | .27½ | .21 | .31 | .15 | .21¾ |
| Arsenic, whi, bbls, powd....lb. | .06 | .08 | .05 | .08 | .04 | .05¾ |

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices. *a* Powdered boric acid $5 a ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

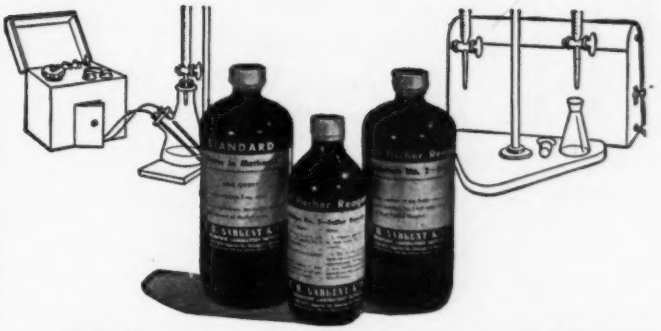
## *Current Prices*

## Barium Gums

| | Current Low | Current High | 1947 Low | 1947 High | 1946 Low | 1946 High |
|---|---|---|---|---|---|---|
| Barium Carbonate precip, wks, bgs.....ton | 67.50 | 82.00 | 60.00 | 82.00 | 60.00 | 75.00 |
| Chloride, tech, cryst, bgs, zone 1.....ton | 85.00 | 95.00 | 73.00 | 95.00 | 73.00 | 78.00 |
| Barytes, floated, paper bgs..ton | no prices | | .... | 41.95 | .... | 41.95 |
| Bauxite, bulk mines.....ton | 8.50 | 10.00 | 7.00 | 10.00 | 7.00 | 10.00 |
| Benzaldehyde, tech, cbys, drs.lb. | .45 | .55 | .45 | .55 | .45 | .55 |
| Benzene (Benzol), 90%, tks, frt all'd.....gal. | .19 | .21 | .19 | .21 | .... | .17 |
| Benzyl Chloride, cbys.....lb. | .20 | .28 | .20 | .28 | .20 | .24 |
| Beta-Naphthol, tech, bbls, wks.....lb. | .23 | .29 | .21 | .29 | .21 | .24 |
| Bismuth metal, ton lots.....lb. | .... | 2.00 | .... | 2.00 | 1.25 | 1.80 |
| Blanc Fixe, 66⅔% Pulp, bbls, wks.....ton | 55.00 | 60.00 | 40.00 | 60.00 | 40.00 | 46.50 |
| Bleaching Powder, wks. 100 lbs. | 2.75 | 3.75 | 2.50 | 3.75 | 2.50 | 3.60 |
| Borax, tech. c-l, bgs.....ton | 53.50 | 56.00 | 45.00 | 56.00 | .... | 45.00 |
| Bordeaux Mixture, bgs.....lb. | .15 | .23 | .11 | .23 | .11 | .11½ |
| Bromine, cases.....lb | .21 | .23 | .21 | .23 | .21 | .23 |
| Butyl, acetate, norm, drs....lb | .30½ | .31½ | .26 | .33½ | .1860 | .26½ |
| Cadmium Metal.....lb. | 1.75 | 1.80 | .... | 1.80 | .90 | 1.55 |
| Calcium, Acetate, bgs..100 lbs. | 3.00 | 4.00 | 3.00 | 4.00 | 3.00 | 4.00 |
| Carbide, drs.....ton | 50.00 | 90.00 | 50.00 | 90.00 | 50.00 | 90.00 |
| Chloride, flake, bgs, c-l...ton | 21.50 | 38.00 | 18.50 | 38.00 | 18.50 | 38.00 |
| Solid, 73-75% drs, c-l....ton | 21.00 | 37.50 | 18.00 | 37.50 | 18.00 | 37.50 |
| Cy'n'd, min. 21% N, c.l...lb. | .02¼ | .02¾ | .02¼ | .02¾ | .... | .... |
| Gluconate, USP, bbls.....lb. | .58 | .65 | .57 | .65 | .57 | .59 |
| Phosphate tri, bbls, c-l....lb. | 6.50 | 6.80 | 6.50 | 6.80 | .... | .0635 |
| Camphor, USP, gran, powd, bbls.....lb. | .72 | .78 | .75 | .82 | .69 | .82 |
| Carbon Bisulfide, 55-gal. drs..lb. | .05 | .05¾ | .05 | .05¾ | .05 | .05¾ |
| Dioxide, cyl.....lb. | .06 | .08 | .06 | .08 | .06 | .08 |
| Tetrachloride, Zone 1, 52½ gal. drs.....lb. | .06½ | .07 | .06 | .07 | .69 | .80 |
| Casein, Acid Precip, bgs, 10,000 lbs. or more.....lb. | .30 | .34 | .26 | .35 | .24 | .33 |
| Chlorine, cyls, lcl, wks, contract.....lb. | .09 | .10½ | .08¾ | .10½ | .... | .07¼ |
| cyls, c-l, contract.....lb. | .... | .06¾ | .... | .06¾ | .... | .05¾ |
| Liq, tk, wks, contract.100 lbs. | .... | 2.25 | .... | 2.30 | .... | 2.30 |
| Chloroform, tech, drs.....lb. | .20 | .23 | .20 | .23 | .20 | .23 |
| Coal tar, wks, crude.....bbl. | 9.50 | 10.00 | 8.25 | 10.00 | 8.25 | 9.00 |
| Cobalt, Acetate, bbl.....lb. | .... | .83¾ | .... | .83¾ | .... | .83¾ |
| Oxide, black kgs.....lb. | 1.275 | 1.80 | .... | 1.30 | 1.80 | 1.84 |
| Copper, metal.....100 lbs. | .... | 21.50 | 21.50 | 24.00 | 12.00 | 14.75 |
| Conbonate, 52-54%, bbls..lb. | .24 | .26 | .19½ | .26½ | .19½ | .20½ |
| Sulfate, bgs, wks cryst. .....100 lbs. | 7.60 | 8.00 | 7.10 | 8.60 | 5.00 | 7.25 |
| Copperas, bulk, c-l, wks....ton | .... | 14.00 | .... | 14.00 | .... | 14.00 |
| Cresol, USP, drs.....lb. | .14 | .15¾ | .13¾ | .15¾ | .10¾ | .14¼ |
| Dibutylamine, c-l, drs, wks..lb. | .... | .76 | .... | .76 | .... | .66 |
| Dibutylphthalate, drs.....lb. | .32 | .38½ | .29 | .38½ | .17 | .29½ |
| Diethylaniline, drs.....lb. | .... | .48 | .... | .48 | .... | .48 |
| Diethyleneglycol, drs, wks...lb. | .14 | .15 | .14 | .15 | .14 | .15 |
| Dimethylaniline, drs, cl., lcl..lb. | .21 | .24¼ | .20 | .24¼ | .21 | .22 |
| Dimethylphthalate, drs.....lb. | .23½ | .24¾ | .20 | .24¾ | .20 | .20½ |
| Dinitrobenzene bbls.....lb. | .... | .16 | .... | .16 | .... | .18 |
| Dinitrochlorobenzene, dms..lb. | .14 | .15½ | .14 | .15½ | .... | .14 |
| Dinitrophenol, bbls.....lb. | .... | .22 | .... | .22 | .... | .22 |
| Dinitrotoluene, drs.....lb. | .... | .18 | .... | .18 | .... | .18 |
| Diphenyl, bbls, lcl, wks.....lb. | .15 | .20 | .15 | .20 | .16 | .20 |
| Diphenylamine bbls.....lb. | .... | .25 | .... | .25 | .... | .25 |
| Diphenylguanidine, drs.....lb. | .35 | .37 | .35 | .37 | .35 | .37 |
| Ethyl Acetate syn. 85-90% tks, frt. all'd.....lb. | .09½ | .12 | .09½ | .12 | .... | .09½ |
| Chloride, USP, bbls.....lb. | .20 | .22 | .18 | .22 | .18 | .20 |
| Ethylene Dichloside, lcl. wks, E. Rockies, drs.....lb. | .08½ | .09½ | .08½ | .09½ | .0842 | .0941 |
| Glycol, dms, cl.....lb. | .... | .12 | .... | .12 | .... | .10 |
| Fluorspar, No. 1, grd. 95-98% bulk, c-l mines.....ton | .... | 37.00 | .... | 37.00 | .... | 37.00 |
| Formaldehyde, bbls, cl & lcl..lb. | .0645 | .0745 | .0520 | .0745 | .0520 | .0570 |
| Furfural tech, tks.....lb. | .... | .09½ | .... | .13 | .... | .13 |
| Fusel Oil, ref'd. drs, dlvd....lb. | .26½ | 29½ | .18½ | 29½ | .18½ | .19½ |
| Glauber's Salt, Cryst, bgs, wks.....100 lbs. | 1.25 | 1.75 | 1.05 | 1.75 | 1.05 | 1.45 |
| Glycerine dynamite, drs, c-l..lb. | .... | .29½ | .29½ | .75¾ | .17 | .55¼ |
| Crude Saponification, 88% to refiners tks.....lb. | .23 | nom. | .23 | .60 | .... | .60 |

| GUMS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gum Arabic, amber sorts bgs.lb. | .14 | .15 | .13¾ | .15 | .11¾ | .14½ |
| Benzoin, Sumatra, cs.....lb. | .50 | .60 | .50 | 1.00 | .52 | 1.70 |
| Copal, Congo No. 1, bgs....lb. | .26 | .29 | .26 | .29 | .... | .55¾ |
| Copal, East India, chips....lb. | no prices | | ....no prices | | .... | .55¾ |
| Macassar DBB, bgs.....lb. | .24 | .25 | .24 | .25 | .... | .07¾ |
| Copal Manila.....lb. | no prices | | .25 | .... | .13½ | .25 |
| Copal Pontianak.....lb. | no prices | | ....no prices | | .... | .17¾ |
| Karaya, bbls. bxs, drs.....lb. | .20 | .51 | .20 | .55 | .18 | .50 |

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined ref'd; tanks, tks; works, f.o.b., wks.

# KARL FISCHER REAGENT

**for Rapid Direct Determination of Water**

**WIDE APPLICATION**

Karl Fischer Reagent is the most specific reagent for water analysis known—Water content of a large number of organic and inorganic compounds can be directly determined simply by titrating the sample with this reagent. Use of Karl Fischer Reagent is particularly advantageous for water determinations of chemical compounds which cannot be made by oven methods because they are either volatile or decompose at oven temperatures.

Available literature indicates water determinations with this reagent have been successfully made on the following types of materials (see bibliography).

- The hydrated inorganic salts
- Monohydric and polyhydric alcohols
- Flexible glue compositions
- Native and processed cellulose
- Oils, fats, and waxes
- Naval stores products
- Liquid petroleum fractions
- Dry food materials
- Moisture in lacquer solvents and diluents A.S.T.M.

In addition to its use for the determination of water, the Karl Fischer Reagent has further wide spread use in the quantitative determination of functional groups of organic compounds.

**RAPID**

Analysis for water with the Karl Fischer technique is performed in only a few minutes as compared to the usual two to four hours required for oven methods. This time factor is particularly important for close control of many plant operations — for example water in processed materials can be determined during the processing and necessary adjustments made at once.

**SHARP VISUAL ENDPOINT**

The reagent itself is a deep orange brown and changes to a chromate yellow after it has been spent with water. The endpoint is sharp and easily detected.

**ELECTROMETRIC TITRATIONS**

With solutions which are highly colored or contain suspended solids, a pH meter or suitable electronic endpoint instrument with platinum-tungsten electrode system is used.

KARL FISCHER REAGENT—Set consisting of solution No. 1—Sulfur Dioxide; solution No. 2—Iodine (supplied in quantities sufficient to prepare 1 quart of Karl Fischer Reagent); 1 quart water in Methanol Standard.

Per set .....$10.00

*Bulletin No. 249 with bibliography mailed on request.*

**SARGENT**

*SCIENTIFIC LABORATORY EQUIPMENT AND CHEMICALS*

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ESTABLISHED 1880

**WM. S. GRAY & CO.**

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Murray Hill 2-3100 Cable: Graylime

Acetic Acid—Acetate of Lime
Acetate of Soda
Acetone C. P.
Butyl Alcohol—Butyl Acetate
Methanol—Methyl Acetone
Methyl Acetate
Formaldehyde
Denatured Alcohol
Turpentine—Rosin
Benzol—Toluol—Xylol
Sodium Benzoate U. S. P.
Benzaldehyde { Technical- N. F. F. F. C.
Whiting
Magnesium Carbonate
Magnesium Oxide

Anti-Freeze—Methanol and Alcohol

## *Current Prices*



| | Current Low | Current High | 1947 Low | 1947 High | 1946 Low | 1946 High |
|---|---|---|---|---|---|---|
| Kauri, N. Y. | | | | | | |
| Superior Pale XXX....lb. | no prices | | .... | nom. | .... | .65¾ |
| No. 3....lb. | no prices | | .... | nom. | .... | .22 |
| Sandarac, cks....lb. | .95 | 1.00 | .85 | 1.00 | .90 | .99½ |
| Tragacanth, No. 1, cases....lb. | 3.60 | 8.70 | 3.60 | 8.70 | 3.75 | 5.25 |
| No. 3....lb. | 2.00 | 2.50 | 2.00 | 3.45 | 2.10 | 3.45 |
| Yacca, bgs....lb. | .06 | .07 | .06 | .07 | .05 | .07¼ |
| Hydrogen Peroxide, cabys...lb. | .15½ | .18½ | .15½ | .18½ | .15½ | .18½ |
| Iodine, Resublimed, jars....lb. | 2.35 | 2.65 | .... | 2.65 | 1.75 | 2.10 |
| Lead Acetate, cryst, bbls....lb. | .... | .19¼ | .... | .19¼ | .... | .16¾ |
| Arsentate basic, bg, lcl....lb. | .22¾ | .23¾ | .... | .23¾ | .12 | .18 |
| Nitrate, bbls....lb. | .17¾ | .18 | .... | .18 | .... | .12½ |
| Red, dry, 95% $Pb_3O_4$ bbls....lb. | .178 | .18½ | .14¼ | .19¼ | .09 | .16 |
| 97% $Pb_3O_4$, bbls delv....lb. | .1785 | .18¾ | .15 | .19½ | .09½ | .16¾ |
| 98% $Pb_3O_4$, bbls delv...lb. | .1810 | .19 | .15¼ | .19¾ | .08¾ | .17 |
| White, bbls....lb. | .16 | .16¼ | .13 | .17¾ | .07½ | .14¼ |
| Basic sulfate, bbls, lcl...lb. | .15¼ | .15½ | .12½ | .15½ | .07¾ | .13¼ |
| Lime, Chem., wks, bulk....ton | 6.50 | 10.25 | 6.50 | 10.25 | 6.50 | 10.25 |
| Hydrated, f.o.b. wks....ton | 8.00 | 12.14 | 8.00 | 12.14 | 8.50 | 12.00 |
| Litharge, coml, delv, bbls...lb. | .1660 | .17½ | .13 | .17½ | .08 | .15¾ |
| Lithopone, ordi., bgs....lb. | .05½ | .06 | .03 | .06 | .04¼ | .05¾ |
| Magnesium Carb, tech, wks..lb. | .07¼ | .10¾ | .07¼ | .10¾ | .07¾ | .10¾ |
| Chloride flake, bbls, wks c-l....ton | .... | 37.00 | .... | 37.00 | .... | 32.00 |
| Manganese Chloride, Anhyd. bbls....lb. | .14 | .16 | .14 | .16 | .14 | .18 |
| Dioxide, Caucasian bgs, lcl....ton | 74.75 | 79.75 | 74.75 | 79.75 | 74.75 | 79.75 |
| Methanol, pure, nat, drs..gal. *l* | .63 | .73 | .63 | .73 | .63 | .73 |
| Synth, drs cl....gal. *m* | .34½ | .41½ | .31 | .41½ | .24 | .38 |
| Methyl Acetate, tech tks....lb. | .06 | .07 | .06 | .07 | .06 | .07 |
| C. P. 97-99%, tks, delv.lb. | .09½ | .10½ | .09½ | .10½ | .09½ | 110½ |
| Chloride, cyl....lb. | .33 | .41 | .32 | .41 | .32 | .40 |
| Ethyl Ketone, tks, frt all'd.lb. | .... | .09 | .... | .09 | .... | .09 |
| Naphtha, Solvent, tks....gal. | .... | .28 | .... | .28 | .... | .27 |
| Naphthalene, crude, 74°, wks, tks....lb. | no prices | | .035 | .083 | .0275 | .035 |
| Nickel Salt, bbls, NY....lb. | .14 | .14½ | .14 | .14½ | .13 | .14½ |
| Nitre Cake, blk....ton | 20.00 | 24.00 | .... | 24.00 | .... | 16.00 |
| Nitrobenzene, drs, wks....lb. | .08½ | .10 | .08 | .09½ | .08 | .09 |
| Orthoanisidine, bbls....lb. | .... | .70 | .... | .70 | .... | .70 |
| Orthochlorophenol, drs....lb. | .... | .37 | .25 | .37 | .25 | .27 |
| Orthodichlorobenzene, drs...lb. | .07½ | .10½ | .07 | .10½ | .07 | .08 |
| Orthonitrochlorobenzene, wks....lb. | .15 | .18 | .15 | .18 | .15 | .18 |
| Orthonitrotoluene, wks, drs..lb. | .08 | .09 | .08 | .09 | .... | .09 |
| Paraldehyde, 98%, wks lcl...lb. | .12½ | .13½ | .22 | .13½ | .... | .12 |
| Chlorophenol, drs....lb. | .25 | .29 | .24 | .29 | .24 | .27 |
| Dichlorobenzene, wks....lb. | .12½ | .14 | .12½ | .14 | .11 | .17 |
| Formaldehyde, drs, wks...lb. | .21 | .22 | .... | .22 | .21 | .22 |
| Nitroaniline, wks, kgs....lb. | .41 | .43 | .41 | .43 | .41 | .45 |
| Nitrochlorobenzene, wks..lb. | .... | .15 | .... | .18 | .... | .18 |
| Toluenesulfonamide, bbls..lb. | .... | .70 | .... | .70 | .... | .70 |
| Toluidine, bbls, wks....lb. | .44 | .53 | .... | .53 | .... | .49 |
| Penicillin, ampules per 100,000 units, bulk.... | .14 | .19 | .14 | .38 | .38 | .95 |
| Pentaerythritol, tech....lb. | .32 | .36 | .27 | .36 | .27 | .31 |

### PETROLEUM SOLVENTS AND DILUENTS

| | | | | | | |
|---|---|---|---|---|---|---|
| Lacquer diluents, tks, East Coast....gal. | .13 | .14 | .... | .14 | .11½ | .12½ |
| Naphtha East tks, wks....gal. | .11 | .11½ | .... | .11 | .11 | 12 |
| Rubber solvents, East, tks, wks....gal. | .12½ | .13 | .... | .12 | .11 | 12 |
| Stoddard Solvents, East, tks, wks....gal. | .11½ | .12 | .... | .12 | .10 | .12 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Phenol, U.S.P., drs....lb. | .11¾ | .13¼ | .11¼ | .13¼ | .10½ | .13¾ |
| Phthalic Anhydride, cl and lcl, wks....lb. | .14½ | .18½ | .14½ | .15½ | .13 | .15½ |
| Potash, Caustics, 88-92%, wks, sol....lb. | .06¾ | .07½ | .06¾ | .07½ | .06¼ | .06¾ |
| Flake, 88-92%....lb. | .07½ | .08¼ | .07 | .08¼ | .07 | .07½ |
| liquid, 45% basis, tks...lb. | .... | .03½ | .... | .03½ | .... | .02½ |
| drs, wks....lb. | .0337½ | .0375½ | .03¼ | .04 | .03 | .03½ |
| Carbonate hydrated 83-85%, bbls....lb. | .05¾ | .06 | .06 | .05¾ | .... | .05½ |
| Chlorate crys, kgs, wks...lb. | .08½ | .09¾ | .08½ | .13 | .11 | .13 |
| Chloride, crys, tech, bgs, kgs....lb. | .08 | nom. | .08 | nom. | .08 | nom |
| Cyanide, drs, wks....lb. | .... | .55 | .... | .55 | .... | .55 |
| Iodide, drs....lb. | 1.95 | 1.98 | 1.44 | 1.98 | 1.44 | 1.48 |
| Muriate dom, 60-62-63% $K_2O$ bulk unit-ton.... | .37½ | .53½ | .37½ | .53½ | .53½ | .56½ |
| Permanganate, USP, wks drs....lb. | .22½ | .23 | .20½ | .23 | .20½ | .21 |
| Sulfate, 90%, basis, bgs..ton | 36.25 | 39.25 | 36.25 | 39.25 | 36.25 | 39.25 |
| Propane, group 3, tks....gal. | .... | .03½ | .... | .03¾ | .... | .03¾ |
| Pyridine, reg., drs....lb. | .60 | .65 | .55 | .65 | .45 | .55½ |
| R Salt, 250 lb. bbls, wks....lb. | .61 | .72 | .... | .72 | .... | .65 |
| Resorcinol, tech. drs, wks...lb. | .... | .68 | .64 | .74 | .64 | .74 |
| Rochelle Salt, cryst....lb. | 32½ | .35 | 32½ | .35 | .34½ | .47 |
| Salt Cake, dom, blk wks....ton | 20.00 | 26.00 | .... | 26.00 | .... | 15.00 |
| Saltpeter, grn, bbls....100 lbs. | 8.00 | 9.50 | 8.20 | 9.50 | 8.20 | 9.00 |

*l* Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

| | Current Low | Current High | 1947 Low | 1947 High | 1946 Low | 1946 High |
|---|---|---|---|---|---|---|
| Shellac, blchd. bone dry, bbls.....lb. | .58½ | .59 | .65 | .74½ | .42½ | .74½ |
| Silver Nitrate, bots, 2,500-oz. lots.....oz. | .42¼ | .45½ | .42¼ | .59 | .47 | .59 |
| Soda Ash, 58% dense, bgs, c-l, wks.....100 lbs. | .... | 1.38 | .... | 1.38 | .... | 1.28 |
| 58% light, bgs cl....100 lbs. | .... | 1.30 | .... | 1.30 | 1.05 | 1.20 |
| Caustic, 76% flake drs, cl.....100 lbs. | .... | 3.25 | 2.90 | 3.25 | .... | 3.00 |
| 76% solid, drs, cl..100 lbs. | .... | 2.85 | 2.50 | 2.85 | .... | 2.75 |
| Liquid, 47-49%, sellers, tks.....100 lbs. | .... | 2.10 | .... | 2.10 | .... | 2.10 |
| Sodium Acetate, anhyd. drs.....lb. | .06½ | .11 | .06½ | .11 | .08½ | .10 |
| Benzoate, USP drs....lb. | .46 | .52 | .46 | .52 | .46 | .52 |
| Bicarb, USP, gran., bgs, cl., works.....100 lbs. | .... | 2.25 | 2.25 | 2.59 | 1.55 | 2.59 |
| Bichromate, bgs, wks l.c.l..lb. | .08¾ | .09¾ | .07⅞ | .09¾ | .07⅞ | .08¾ |
| Bisulfate powd, bbls, wks.....100 lbs. | 3.00 | 3.60 | 3.00 | 3.60 | 3.00 | 3.60 |
| 35° bbls, wks.....100 lbs. | 1.40 | 1.65 | 1.40 | 1.65 | 1.40 | 1.65 |
| Chlorate, kgs, wks cl.....lb. | .... | .06¾ | .... | .06¾ | .... | .06¼ |
| Cyanide, 96-98%, drs....lb. | .14½ | .15 | .14½ | .15 | .14½ | .15 |
| Fluoride, 95%, bbls, drs...lb. | .09¾ | .10 | .07¼ | .10 | .07¼ | .08¼ |
| Hyposulfite, cryst, bgs, cl, wks.....100 lbs. | .... | 2.75 | ... | 2.75 | .... | 2.25 |
| Metasilicate, gran, bbl. wks c-l.....100 lbs. | .... | 3.40 | .... | 3.40 | .... | 3.40 |
| Nitrate, imp. bgs.....ton | .... | 42.50 | .... | 42.50 | 33.00 | 38.50 |
| Nitrite, 96-98% bbl. cl....lb. | .... | .06¾ | .... | .06¾ | .... | .06¾ |
| Phosphate, dianhyd. bgs, wks.....100 lbs. | 6.25 | 7.00 | 6.00 | 7.00 | 6.00 | 6.75 |
| Tri-bgs, cryst, wks.100 lbs. | 3.50 | 3.90 | 2.70 | 3.90 | 2.70 | 3.10 |
| Prussiate, yel. bbls, wks...lb. | .... | .12¼ | .... | .12¼ | .... | .11 |
| Silicate, 52°, drs, wks...100 lbs. | 1.55 | 2.00 | 1.40 | 2.00 | 1.40 | 1.80 |
| 40°, drs, wks, c-l...100 lbs. | .95 | 1.15 | .... | 1.15 | .... | .80 |
| Silicofluoride, bbls, NY...lb. | 0.6¼ | .08½ | .06¼ | .08½ | .06½ | .10 |
| Sulfate tech, Anhyd, bgs.....100 lbs. | 2.10 | 2.60 | 1.70 | 2.60 | 1.70 | 2.20 |
| Sulfide, cryst c-l, bbls, wks.....100 lbs. | .... | 3.25 | .... | 3.00 | .... | 2.40 |
| Solid, bbls, wks....lb. | 3.50 | 5.50 | 3.05 | 5.50 | 3.15 | 3.90 |
| Starch, Corn, Pearl, bgs.100 lbs. | 6.37 | 7.17 | 4.99 | 7.17 | 4.321 | 6.271 |
| Potato, bgs, cl.....lb. | .0875 | nom. | .0875 | .1075 | .0735 | .0760 |
| Rice, bgs.....lb. | no stocks | | no stocks | | no stocks | |
| Sweet Potato, bgs.....lb. | no stocks | | no stocks | | no stocks | |
| Sulfur, crude, mines.....ton | 16.00 | 18.00 | 16.00 | 18.00 | .... | 16.00 |
| Flour, USP, precp, bbls, kgs.....lb. | .18 | .30 | .18 | .36 | .18 | .36 |
| Roll, bbls.....100 lbs. | 2.65 | 3.40 | 2.65 | 3.40 | 2.40 | 3.40 |
| Sulfur Dioxide, liquid, cyl...lb. | .... | .085 | .07 | .095 | .07 | .08 |
| tks, wks.....lb. | .... | .044 | .... | .044 | .... | .04 |
| Talc, crude, c-l, NY....ton | .... | 15.00 | .... | 15.50 | .... | 15.50 |
| Ref'd, c-l, NY....ton | 14.50 | 24.50 | 14.50 | 24.50 | 13.00 | 21.00 |
| Tin, crystals, bbls, wks.....lb. | .55 | .60 | .... | .60 | no stocks | |
| Metal.....lb. | .... | .80 | .... | .80 | .... | .70 |
| Toluol, drs, wks....gal. | .28 | .29½ | .28 | .29½ | .27 | .32 |
| tks, frt all'd....gal. | .... | .23 | .... | .23 | .22 | .27 |
| Tributyl Phosphates, drs, lcl. frt all'd.....lb. | .68 | .72 | .... | .72 | .... | .65 |
| Trichloroethylene, drs, wks..lb. | .09¼ | .10½ | .08 | .10½ | .08 | .09 |
| Tricresyl phosphate tks.....lb. | .32¼ | .33 | .32¼ | .33 | .... | .32 |
| Triethylene glycol, drs.....lb. | .18½ | .19½ | .18½ | .19½ | .18½ | .19½ |
| Triphenyl Phos., bbls.....lb. | .26 | .27 | .26 | .32 | .26 | .32 |
| Urea, pure, cases.....lb. | .... | .12 | .... | .12 | .... | .12 |
| Wax, Bayberry, bgs.....lb. | no stocks | | no stocks | | no stocks | |
| Bees, bleached, U.S.P. cakes.lb. | .65 | .73 | .68 | .73 | .60 | .70 |
| Candelilla, bgs, crude.....lb. | .62 | .65 | .62 | .80 | .62 | .86 |
| Carnauba No. 1, yellow, bgs, ton.....lb. | 1.30 | 1.55 | 1.30 | 2.00 | 1.80 | 2.04 |
| Xylol, Indus., frt all'd, tks wks.....gal. | .23 | .25 | .... | .23 | .... | .26 |
| Zinc Chloride tech. fused, wks.....lb. | .0625 | .0655 | .05 | .0655 | .05 | .0535 |
| Oxide, Amer., bgs. wks....lb. | .095 | .10 | .09 | .10 | .07 | .09¼ |
| Sulfate, crys, bgs....100 lbs. | 4.15 | 4.90 | 3.40 | 4.90 | 3.40 | 4.15 |
| **OILS AND FATS** | | | | | | |
| Babassu, tks.....lb. | .14½ | .27½ | .14½ | .27½ | .11 | .12 |
| Castor, No. 3, drs, c.l.....lb. | .27¾ | .34¾ | .27¾ | .34¾ | .... | .29¾ |
| China Wood, drs, spot NY..lb. | .25¾ | .27 | .24 | .41 | .39 | .41 |
| Coconut, edible, drs Atlantic ports.....lb. | .18 | .27 | .18 | .37 | .... | .27 |
| Corn, crude, tks, wks.....lb. | .... | .31 | .... | .31 | .... | .27 |
| Linseed, Raw, drs, c.l.....lb. | .3160 | .3230 | .3160 | .3960 | .1680 | .3640 |
| Menhaden, crude tks..... | .19 | .22 | .19 | .22 | .1220 | .21½ |
| Light, pressed, drs l.c.l....lb. | .16 | .26 | .16 | .29 | .1300 | .29 |
| Palm, Niger, dms.....lb. | no prices | | no prices | | .... | .0865 |
| Peanut, crude, tks, f.o.b. wks lb. | .17 | nom. | .20 | .37 | .12¾ | .28½ |
| Perilla, crude, dms, NY.....lb. | no stocks | | no stocks | | no stocks | |
| Rapeseed, bulks.....lb. | no prices | | ....no prices | | .... | .13 |
| Red, dms.....lb. | .17¾ | .33¾ | .17¾ | .33¾ | .13¼ | .30¾ |
| Soy Bean, crude, tks, wks...lb. | .15½ | .2934 | .15¼ | .33 | .1175 | .2450 |
| Tallow, acidless, dms.....lb. | .19½ | .35 | .19½ | .35 | .... | .14¼ |

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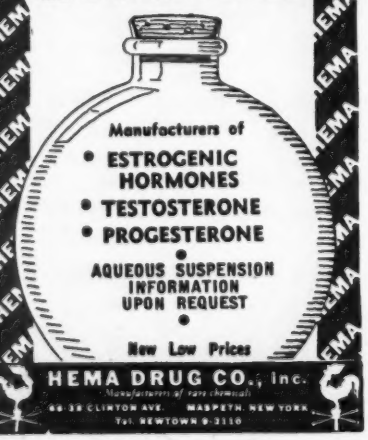

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28—Pebble and Ball Mills by Abbe, Porter, Hardinge, Patterson and others; all sizes.

65—Mixing Kettles and Reactors; Vacuum Pans and Stills in Steel, Stainless, Copper, Iron, etc.; state size required.

30—Heavy Duty Horizontal Jacketed Mixers, 100 gal. working capacity; double arm, geared both ends.

40—Tablet Presses, single punch, rotary — Stokes, Colton, Kux — state tonnage, size of tablets, quantity.

12—Rotary Drum Dryers, single and double drum from Lab. size to 4'x12'.

9—Rotary Vacuum Filters, Oliver, Portland, Feinc, etc.

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3—Shriver Plate and Frame, 42"x42", Filter Presses.

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3—Hardinge Conical Mills, 22"x42", 36"x7', and 4'x14'6".

5—Ball Mills by Abbe, Stearns-Rogers, Haynes; 24"x36", 3'x3', others.

7—Tube Mills by Allis-Chalmers, Stearns-Rogers, Patterson and Abbe; sizes are 3'x10', 4'x16', 4'x21' and 5'x22'.

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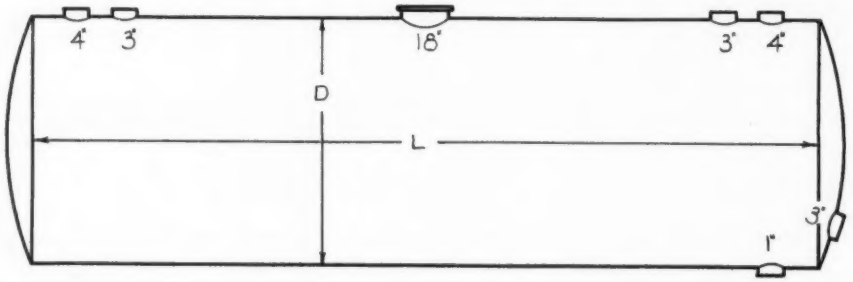


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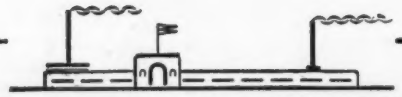

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1—Stokes 20 Shelf Vac. Dryer
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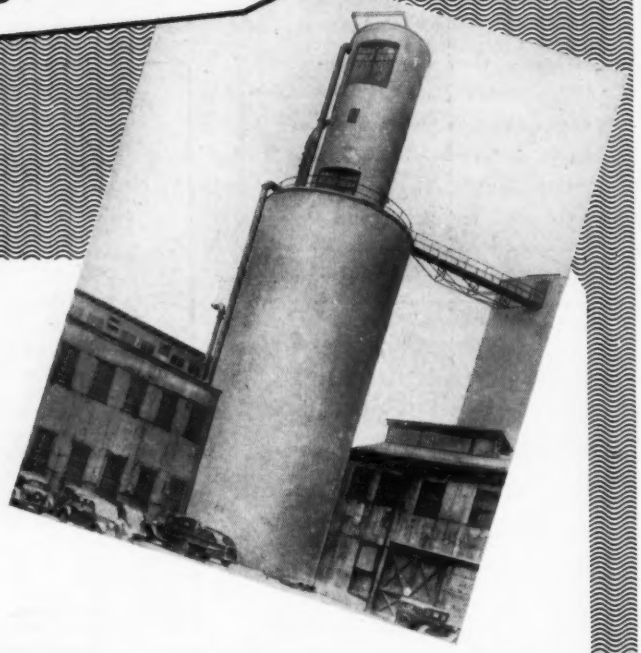

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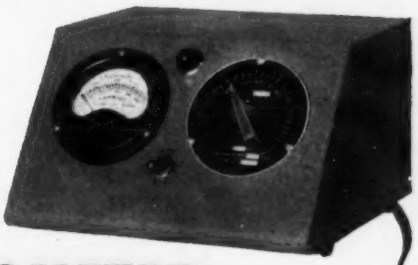

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The New Sodium Sulphate plant at Chaplin, Saskatchewan, Canada, expects to be producing natural Sodium Sulphate of a very high degree of purity early in 1948.

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BUFFALO 5, NEW YORK

# "WE"— EDITORIALLY SPEAKING

TO ALL OUR FRIENDS who sent Christmas greetings and their best wishes for a happy new year, we say, "Thanks!" To them, and to all of you, we send a wish that 1948 may top 1947 in every respect. And we know that you join with us in hoping that this sorry old world will smile a little next year at this time, so that more people—all over—can look forward to a happy new year, American style!

SO MUCH OF THE NEWS in the daily papers is bad, it's comforting to think about all the good news that's too commonplace to get into the headlines. For example: During 1947 approximately 33,702,000 marriages didn't go on the rocks. Some 87,481,710 motorists drove 350 billion miles without getting killed. Flying over the U. S. landscape without injury were 12,577,000 air travelers. Over 7,100,000 veterans continued in their refusal to join the 52-20 Club. And 14,800,000 workers didn't go out on strike.

Those figures impressed us, but when we thought of all the days during 1947 we didn't hear a singing commercial, we really felt we had something to be thankful for.

WE'RE STILL PUZZLING over this sentence in the preface to a manufacturer's bulletin on one of his chemicals: "There are of course many more undiscovered uses." We won't belabor the obvious inconsistency; maybe he had a revelation.

THE POWER OF SUGGESTION is a force to be reckoned with. Every store we went into to do our Christmas shopping had "I'm Dreaming of a White Christmas" blaring over a public-address system, and we sure got it—26 inches of it. One of us mushed into the office the Saturday after to clean up some last-minute work, but several of us were marooned in the country. We're several years too young to remember the blizzard of '88, but now we've got something to tell *our* grandchildren.

We couldn't help wondering Friday afternoon what happened to the General Electric crowd. They should have been dropping dry ice over the Atlantic Ocean, persuading the clouds to dump the jolly stuff where it couldn't tie up traffic.

It made us think, too, of all the pat phrases and threadbare clichés about "Man conquering Nature," "subjugation of natural forces to Man's inflexible will," and all the other old yarns that speeches are woven of. We'll bet those earth-shakers huddled up to the fire just like us, waiting for the snow-plow.

## *FIFTEEN YEARS AGO*

(From Our Files of Jan., 1933)

*Chemical industry cooperates in the House investigation of government competition with private business. National Association of Manufacturers, Manufacturing Chemists' Association and the Association of Consulting Chemists and Chemical Engineers join fight. Latter two attack unwarranted research by government departments.*

*M. C. A. secretary Warren D. Watson suggests curtailment of government research by limitation of funds. He also reviews the patent situation and the conducting of free technical consulting services.*

*President-elect Roosevelt announces that he will make a personal inspection of the country's prize "white elephant"—the $150,000,000 power and nitrate plant at Muscle Shoals.*

*Charles L. Reese, retired chemical director of du Pont is elected A. C. S. president for 1934.*

*Merck's Peter Dougan is elected president, National Association of Insecticide and Disinfectant Manufacturers, Inc.*

*Emergency Unemployment Relief Committee finances staff of 100 men at Columbia University to aid technocracy group of engineers in extensive study.*

*Perkin Medal of the Society of Chemical Industry is presented to Goodrich's George Oenslager for his contributions to the rubber industry—in particular, development of organic vulcanization accelerator and of the carbon black type of tire tread.*

## *THIRTY YEARS AGO*

(From Our Files of Jan., 1918)

*Merck increases capital from $250,000 to $1,000,000.*

*E. I. du Pont de Nemours & Co. purchases land in Chicago for dyestuffs plant.*

*Heller and Merz, Newark, N. J., chemicals, dyes, etc., incorporated with capital stock of $1,500,000.*

*U. S. Industrial Chemicals, Inc., acquires distillery in Peoria with plans for reconstruction and improvement of the plant for manufacture of chemicals.*

***"I don't know who he is. Joe says he's been hired to do chemical market research."***

AT LONG LAST a commercial firm has seen fit to honor its slave labor. Bernard Oser, vice-president of Food Research Laboratories, Inc., unveiled a three-foot statue, at the ceremonies commemorating the company's 25th anniversary, after reading the following dedication:

"In gathering this evening to celebrate the silver anniversary of Food Research Laboratories, Inc., we wish to honor one whose efforts, whose sacrifices, whose very life has been dedicated to the attainment of this goal.

"The sharpness of his vision pierced through the darkness of the unknown. He never ceased scratching through the surface of knowledge to reveal new discoveries. Where before there was only supposition *in vitro*, he offered proof *in vivo*. Yet upon his head was heaped calumny by those to whom his very name is anathema.

"Though his lot has made him prematurely white, he has never uttered a word of complaint. May each succeeding generation follow the example of this humble worker, in whose honor tonight we unveil this statue.

"For labor long on vitamins and such,
For assay methods which we use so much,
For tests on skin and hair and bone,
Metabolism, proteins, blood and tone.
For these and many another chore
To open Nature's secret door,
We lift the veil and place on view
Him to whom all credit is due.
May his progeny give, as he begat;
Ladies and gents: His Honor, The Rat!"

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# QUININE

## *Available in Adequate Quantities*

*Merck & Co., Inc. is now in a position to supply your requirements for the following Quinine salts:*

**Quinine Alkaloid**
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**Quinine Salicylate**
**Quinine Sulfate**

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Now entirely free from Government control, these Quinine salts are available for the manufacture of proprietary products, cold tablets, chill tonics, industrial and other products, as well as for antimalarial therapy.

Cinchonine and Cinchonidine in the form of alkaloid and usual salts, as well as minor Quinine salts, will be available soon. It is expected that Quinidine Alkaloid and Sulfate will continue in short supply and hence remain under allocation.

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**COMPOSITION**

Zircon (Zirconium Silicate) $ZrSiO_4$ . . 67% $ZrO_2$+33% $SiO_2$

**MECHANICAL, THERMAL, CHEMICAL AND PHYSICAL PROPERTIES**

| | |
|---|---|
| Crystal Structure | Tetragonal |
| Molecular Weight | 183 |
| Molecular Volume | 38.7 |
| Moh's Hardness | 7.5 |
| Thermal Conductivity cal/°C/sec/cm/$cm^2$ (up to 700°F=0.031 Watts/$in^2$/in/°F) | 0.0046 |
| Refractive index Ne | 1.94-2.02 |
| Refractive index for No | 1.92-1.96 |
| Birefringence | 0.045-0.058 |
| Mean Specific Heat (21-51°C) | 0.132 |
| Softening Point | 3452°F |
| Melting Point | 4622°F |
| Thermal Expansion (mean reversible 20°-1000°C) | $4.5x10^{-6}$/°C |

Insoluble in aqueous alkaline solutions and in all acids except hydrofluoric (slightly soluble).

**ELECTRICAL PROPERTIES**

| | | |
|---|---|---|
| Dielectric Constant E | | 12±1 |
| Resistivity at °F in Megohms/$in^3$ | 1100° | 170 |
| | 1200° | 120 |
| | 1300° | 70 |
| | 1400° | 25 |
| | 1500° | 7 |
| | 1600° | 2.5 |

Properties of Zirconium Silicate, developed by over 30 years of TAM research, find large scale usage in a range of applications. Increasing tonnages are used in the manufacture of dry process and porcelain enamel frits. For opacification and craze resistance of ceramic glazes, $ZrSiO_4$ also finds volume application. It is used extensively in acid and electrical resisting cements and in the manufacture of high temperature and special refractories. Its high mechanical strength and thermal shock resistance make it ideal as a body constituent in certain electrical porcelains. As a mold and core wash ingredient and as a mold material in precision alloy castings and kiln furnace coatings, there is a mounting demand for Zirconium Silicate.

**TAM**

**TITANIUM ALLOY MANUFACTURING COMPANY**

*Executive Offices:* 111 Broadway, New York City *General Offices and Works:* Niagara Falls, N. Y.

# *Abstracts of U. S. and Foreign Patents*

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

Requests for further information or photostated copies of Canadian patents should be addressed to the Commissioner of Patents and Copyrights, Department Secretary of State, Ottawa, Canada.

*U. S. Patents from Official Gazette—Vol. 602, Nos. 1, 2, 3, 4 (August 26-September 16)*
*Canadian Patents Granted and Published October 28-November 25.*

## *Processes and Methods

**Separating flocculatable and gritty solids from liquids.** No. 2,425,065. Arthur M. Kivari to The Dorr Company.

**Producing light colored sulphurized products** from starting materials selected from unsaturated fatty acid triglycerides, unsaturated oil soluble thermoplastic resins, and mixtures of them. No. 2,425,597. John W. Church to Falk & Company.

**In preparation of gaseous mixture** containing hydrogen and less than 1% carbon monoxide steps comprise catalytically reacting water and methanol in presence of catalyst selected from zinc-copper and zinc-copper-chromium containing catalysts under conditions ranging between molar ratio of water to methanol of 1.8:1 at temperature less than 200°C to molar ratio of 6:1 at temperature less than 330°C. No. 2,425,625. Alfred T. Larson to E. I. du Pont de Nemours & Company.

**Preparation of aminoformals** comprises hydrogenating cyanoformal in presence of hydrogenation catalyst and ammonia at 25 to 200°C, at pressure between 200 and 700 atoms. No. 2,425,628. Donald John Loder and Walter Martin Bruner to E. I. du Pont de Nemours & Company.

**Preparing reaction mixture of drying oil** with polymerization catalyst for such reaction comprises circulating body of oil in cyclic mixing zone including mixing stage, adding catalyst to oil in mixing stage, subjecting oil in zone to agitation capable of dispersing catalyst in oil and of dispersing local masses of plastic solid or semi-solid phase formed, etc. No. 2,425,671. George S. Crandall and Carleton H. Schlesman to Socony-Vacuum Oil Company, Inc.

**Regenerating spent powdered catalyst** contaminated with carbonaceous deposits. No. 2,425,849. Vanderveer Voorhees to Standard Oil Company.

**Eliminating foaming in recovery of sulfuric acid** from olefin recovery operation. No. 2,426,082. John H. Cone to Standard Oil Development Company.

**In regenerating spent aqueous alkaline solutions** containing hydrosulfides extracted from sour hydrocarbons, improvement comprising contacting spent solution with oxygen-containing oxidizing agent for hydrosulfides in presence of small amount of nitrobenzene oxidation catalyst. No. 2,426,087. Lloyd C. Fetterly to Shell Development Company.

**Treatment of extract** under superatmospheric pressure resulting from contact of sulfuric acid with low molecular weight olefins. No. 2,426,088. Bryson M. Filbert to Standard Oil Development Company.

### *Canadian*

**Method of recovering oily constituents from lignite coal.** No. 444,408. William Fred Sayer.

## *Rubber

**Transforming alkaline dispersion** of synthetic rubber comprising polymer of butadiene-1,3 into synthetic rubber sheet. No. 2,424,648. Willard F. Bixby to The B. F. Goodrich Company.

**Tubeless tire and rim.** No. 2,424,918. Roy W. Brown to The Firestone Tire & Rubber Company.

**Injecting chlorine, into aqueous suspension of granular porous solution-chlorinated rubber** obtained by chlorinating solution of rubber in organic solvent, etc. No. 2,424,920. Harry E. Albert and Robert J. Reid to The Firestone Tire and Rubber Company.

**Heating linear polysulfide polymer** to 100°C to 200°C stretching polymer under tension cooling polymer to less than 100°C while maintaining it under tension. No. 2,425,045. Joseph C. Patrick to Thiokol Corporation.

**Plasticized butadiene polymer compositions** containing phthalimidoalkyl alkanoates. No. 2,425,288. Philip F. Tryon to Commercial Solvents Corporation.

**Coagulating synthetic rubber latex** consisting of copolymer of conjugated diolefin and unsaturated comonomer in aqueous dispersion. No. 2,426,127. Robert M. Thomas and Donald C. Field to Jasco, Incorporated.

## *Specialties

**Pregummed hanging material** comprising base having dried adhesive comprising hydrolyzed cereal flour. No. 2,424,546. Jordan V. Bauer and Rudolph A. Selner to Stein, Hall & Co., Inc.

**Liquid rubber like composition** to be used as cement between rubberlike materials and metal parts. No. 2,424,736. Stewart L. Brams to General Motors Corporation.

**Insecticidal composition** comprising mineral oil and compound selected from unsaturated and saturated aliphatic and alicyclic mon-oxime esters of aliphatic carboxylic acids. No. 2,424,860. Alva V. Snider and John L. Van Winkle to Shell Development Company.

**Producing dental impression material** comprising mixing water soluble silicate with metal phosphate and dehydrating this mixture at elevated temperature, etc. No. 2,424,895. Stanley E. Noyes.

**Preparing emulsion for application to fruit and vegetables** to retard decay and minimize shrinkage consists in heating candelilla wax and oleic acid to temperature between 190° and 212°F adding aqueous solution of sodium hydroxide to saponify fats and fatty acids, etc. No. 2,424,952. James Otis Handy to Duzzel Corporation.

**Preparing hectographic ink,** coloring matter of which is composed of plurality of water-soluble dyes of different colors. No. 2,424,954. Douglas A. Newman to Columbia Ribbon and Carbon Manufacturing Co., Inc.

**Pressure-sensitive adhesive tape** having paper backing impregnated with hydrophilic proteinaceous impregnant, hydrophobic pressure-sensitive adhesive mass on one side of backing priming coat between backing and adhesive mass. No. 2,424,996. Vlon Neilan Morris to Industrial Tape Corporation.

**Insecticidal composition** comprising pyrethrum and N-cyclo-substituted cyclo-olefinic imine having imino nitrogen atom linked between two ring carbon atoms. No. 2,425,185. Vernon E. Haury to Shell Development Company.

**Contact insecticidal composition** comprising piperine and pyrethrin in liquid spray base of petroleum origin. No. 2,425,530. Edward Harvill to Boyce Thompson Institute for Plant Research, Inc.

**Preparing non-curling decalcomania paper,** consists in releasably bonding, to one side of backing sheet of water absorbent paper, by water-soluble starch-dextrose adhesive, coating adapted to take decalcomania design, covering opposite side of sheet with dried layer of granular gelatine which has been swelled in warm mixture of water and alcohol in ratio of three to two. No. 2,425,653. John W. Stewart to The Cuneo Press, Inc.

**Fungidical composition** comprising mixture of paraformaldehyde and sym.-trichloroaniline. No. 2,425,677. Wilbie S. Hinegardner and Norman D. Scott to E. I. du Pont de Nemours & Company.

**Fungicidal composition** comprising mixture of paraformaldehyde and dihydronaphthalene No. 2,425,678. Wilbie S. Hinegardner and Joseph Frederick Walker to E. I. du Pont de Nemours & Company.

**High temperature resisting crayon** comprising self-sustaining body composed of mixture including clay, talc, corn flour and polyvinyl alcohol. No. 2,425,804. Arthur M. Hossenlopp to Henry L. Crowley & Company, Inc.

**Aqueous metallic soap emulsion** comprises emulsion having water as continuous phase, water-insoluble metallic soap in discontinuous phase, water-compatible nonionic ester of fatty acid containing 10 to 24 carbon atoms per molecule with polyethylene glycol having molecular weight in excess of 200 as emulsifying agent. No. 2,425,828. Clinton E. Retzsch and Charles H. Lighthipe to Nopco Chemical Company.

**Washing glass objects** and objects with ceramic surfaces comprising contacting object with heated aqueous solution of 3% by weight NaOH content, inhibiting corrosive attack of NaOH on such objects by incorporation in such solution 3.9-6.6% by weight of NaOH present, on anhydrous basis, of water-soluble chloride of metal selected from Sr, Ba, Sn, Sb and Bi. No. 2,425,907. Walter F. Wegst and Leslie R. Bacon, Thomas H. Vaughn and Duncan J. Crawford to Wyandotte Chemicals Corporation.

### *Canadian*

**A match comprising a wooden splint** provided with a tip of igniting composition comprising an igniter, a filler and polymerized rosin. No. 444,630. Hercules Powder Company (Arthur Hall Sanford).

## *Textiles

**Composite textile strand** comprising at least one inorganic fiber and discrete elements of an organic plastic composition covering portion only of surface of inorganic fiber and projecting therefrom to greater effective diameter in strand than inorganic fiber. No. 2,424,743. Archibald H. Davis.

**Improving whiteness of normally white textile materials** adapted for repeated laundering and which have acquired a yellowish or off-white tint, comprises treating materials following laundering by rinsing in solution of blue fluorescent substance and ultramarine. No. 2,424,778. Peter Wright Tainsh to Lever Brothers Company.

**Uniformly dyeing in solid color throughout,** it is thickness fibrous textile material comprising cellulose carboxylic ester fibers. No. 2,424,857. Herbert G. Scull to Eastman Kodak Company.

**Producing flexible, water and wear-resistant leather-substitute product** comprising impregnating and coating woven textile fabric with varnish of oil modified thermosetting resin which produces upon curing a hard, inflexible, non-sticky crust on surface of fabric, etc. No. 2,424,861. Howard Snow to Southern Friction Materials Company.

**Bonding textile materials to rubbery polymers** comprising blend of cyclized rubber. No. 2,425,348. Herman E. Schroeder to E. I. du Pont de Nemours & Company.

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* *U. S. Patents from Vol. 601, Nos. 1, 2, 3, 4.*
*Canadian from September 30 - October 21.*

**Laminated structure** comprising rubbery polymer and textile material adhered to each other by blend of cyclized rubber. No. 2,425,349. Herman E. Schroeder to E. I. du Pont de Nemours & Company.

**Diamide textile lubricants.** No. 2,425,392. Edwin A. Robinson and Maurice J. Kelley to Nopco Chemical Company.

**Hydroxylated polyamide textile lubricants.** No. 2,425,393. Edwin A. Robinson and Maurice J. Kelley to Nopco Chemical Company.

**Manufacturing thin articles,** such as fibers and films from protein, comprising treating protein in aqueous solution with detergent selected from alkyl aryl sulphonates and alkyl sulphates whereby molecules of detergent attach themselves to protein molecules, etc. No. 2,425,550. Harold P. Lundgren.

**Production of artificial filaments** having basis of a filament-forming material by wet-spinning processes, comprises extruding solution of cellulose acetate in acetone into setting atmosphere consisting of mist of water droplets wherein extruded cellulose acetate material is solidified, passing solidified cellulose acetate material through water. No. 2,425,782. Joseph E. Bludworth and Canfield Hutson to Celanese Corporation of America.

**Bleaching cotton textile goods** in which goods are subjected to desizing, souring, and bleaching treatments, carrying out souring step by subjecting goods to treatment with aqueous solution containing 0.5% to 20% by weight of peracid taken from persulfuric acid, peracetic acid, monoperbenzoic acid, monoperphthalic acid, and monopersuccinic acid, bleaching with aqueous alkaline solution of peroxygen compound taken from hydrogen peroxide and sodium peroxide. No. 2,426,142. Donald J. Campbell to E. I. du Pont de Nemours & Company.

*Canadian*

**Finishing textiles** by applying thereto a formaldehyde condensation product of an N-substituted guanamine. No. 444,417. American Cyanamid Company (Jack T. Thurston).

**Rendering net fabrics** resistant to distortion by laundering with a resin emulsion. No. 444,418. American Cyanamid Company (Ralph M. Fischer).

**Fibres, filaments, threads, bands,** films and the like obtained by extrusion of a protein solution prepared with the aid of alkali, into a coagulating bath. No. 444,474. George Stephan de Kadt.

## *Agricultural*

**Milkweed gin.** No. 2,426,813. Boris Berkman and Alfons R. Bacon and Carl Weber to Milkweed Products Development Corporation.

## *Ceramics*

**Magnetic sheetlike material** having insulating coating bonded thereto, coating consisting of 2 to 20% magnesium oxide with remainder vermiculite. No. 2,426,445. Wayne R. Frisch and Charles W. Crew to General Electric Company.

**Borosilicate glasses.** No. 2,426,472. John E. Stanworth to General Electric Company.

**Condenser dielectric** comprising coating thixotropic suspension of alkali earth titanate in alcohol on film of polystyrene, drying, calendering, then drying. No. 2,426,609. Frank B. Hodgdon to Western Electric Company, Inc.

**Method and apparatus for fusing refractory materials.** No. 2,426,643. Raymond R. Ridgway to Norton Company.

**Furnace for fusing refractory materials.** No. 2,426,644. Edward Van der Pyl to Norton Company.

**Spark plug** having ceramic insulator comprising fired mixture containing major proportion of zirconium oxide plus magnesium oxide. No. 2,427,034. Eugene Wainer to The Titanium Alloy Manufacturing Company.

**Making corundum jewels** comprises mixing substances in colloidal particle form including alumina, silica, magnesium hydroxide, iron hydroxide, and titanium hydroxide with water to form dough-like mass, etc. No. 2,427,454. John Allen Heany.

## *Coatings*

**Improved bituminous bonding material** comprising asphalt and acyl amidioamine soap, acid represented in acyl group and also in soap radical being organic acids derived from talloil. No. 2,426,220. James M. Johnson to Nostrip Inc.

**Making composition for use as dispersant** in production of water-thinnable and oil-thinnable coating compositions comprises reacting 16 parts of comminuted rosin with mixture comprising alkali metal hydroxide, water, pine oil, borax. No. 2,426,277. Gustavus Harry Miller.

**Coating composition** which is aqueous emulsion of 10 parts of melamine-formaldehyde resin prepared by reacting one mol of melamine with 6 mols of formalin and reacting condensation product thereof with butanol, 90 parts of cellulose acetate, 100 parts of fatty oil modified phthalic glyceride resin. No. 2,426,379. Robert C. Swain and Pierrepont Adams to American Cyanamid Company.

**Lacquer** comprising chlorinated natural rubber, chloropropane wax, and hexachlorobutadiene. No. 2,426,512. Charles B. Large, Maurice J. Zucrow and Robert L. Hirsch to Aerojet Engineering Corporation.

**Dispersion of synthetic graphite** in volatile liquid for coating surfaces by drying through volatization. No. 2,426,983. Austin T. Collins.

**Improving brushing qualities** of paint comprising adding to paint halogen-bearing ester selected from chlorine-bearing monohydric esters and halogen-bearing dihydric esters. No. 2,427,082. Paul Zurcher.

**Asphalt composition** comprising asphaltic material containing dispersed small amounts each of cation-active bonding agent free from amido groups and water-insoluble metallic soap-type bonding agent. No. 2,427,488. Alvin P. Anderson and Fred H. Stross to Shell Development Company.

**Thorium compound protective coatings for reflecting surfaces.** No. 2,427,592. Glenn L. Dimmick to Radio Corporation of America.

*Canadian*

**Heat-stable bituminous product** suitable for use as a steep-roofing pitch. No. 444,719. Allied Chemical & Dye Corp. (Benjamin Albert Anderton).

**Treating a glass surface** to reduce the proportion of incident light reflected from the surface. No. 445,128. Pilkington Bros., Ltd. (Arthur Roland Wood).

## *Dyes*

**Disazo dyes from dihydroxy benzidines.** No. 2,425,977. Fritz Straub, Jakob Brassel and Peter Pieth to Society of Chemical Industry in Basle.

**Dyestuffs of anthraquinone series and process for their manufacture.** No. 2,427,527. Ernst Gutzwiller to Sandoz Ltd.

**Pyrazolone disazo dyestuffs.** No. 2,427,534. Peter Pieth to Society of Chemical Industry in Basle.

**Disazo dyes from tetrazotized dihydroxy benzidines.** No. 2,427,537. Fritz Straub and Jakob Brassel and Peter Pieth to Society of Chemical Industry in Basle.

**Manufacture of complex copper compound** of substantive polyazo dyestuff. No. 2,427,539. Walter Wehrli to Sandoz Ltd.

## *Equipment*

**Device for determining viscosity** of moving fluid. No. 2,426,263. Kermit Fischer.

**Apparatus for removing impurities from finely divided solids** capable of being formed into small masses by means of liquid. No. 2,426,296. Heinz Henry Chesny.

**Brush** which when used in dry condition will remain static free. No. 2,426,315. Louis Marick to United States Rubber Company.

**Apparatus for rapidly freezing liquid heterogenous mixture.** No. 2,426,368. Walter W. Mayne and Kenneth A. Murphy to Pre-Pak Freezer Corporation.

**Sampler** comprising fitting having inlet and outlet for connection with flow pipe, etc. No. 2,426,369. Clarence W. Paulsen.

**Device for determining viscosity of moving fluid.** No. 2,426,393. Kermit Fischer to Fischer & Porter Company.

**Cracking and coking oven** for pyrolytic treatment of hydrocarbon material to produce aromatic hydrocarbons and coke. No. 2,426,612. Charles H. Hughes to Hughes By-Product Coke Oven Corporation.

**Densitometer** for measuring light transmission of fluid while submerged therein. No. 2,427,013. Jesse Edward MacAdams.

**Permanent magnet** comprising magnetized body composed of alloy of 75 to 86% iron and balance molybdenum and vanadium. No. 2,427,018. Ethan A. Nesbitt to Bell Telephone Laboratories, Inc.

**Collapsible solar distillation apparatus.** No. 2,427,262. William P. R. Delano to Gallowhur Chemical Corporation.

*Canadian*

**Dry-cell leak-proof top closure.** No. 444,999. Ray-O-Vac Co. (Howard J. Smithback).

## *Explosives*

**Explosive device,** comprising casing hermetically enclosing liquid combustible body, closed chamber centrally disposed in and surrounded by combustible body in casing, etc. No. 2,426,269. Nevil Monroe Hopkins, and Raymonde B. Hopkins.

**Apparatus for filling shells** or like with melted explosive comprising frame, funnel, spout, steam jacket, etc. No. 2,426,619. Thomas F. Knight.

## *Food*

**Stabilizing fatty material** comprising contacting fatty material with vegetable meal in presence of relatively small amount of ammonia. No. 2,426,486. Loran O. Buxton and Charles E. Dryden to Nopco Chemical Company.

**Food concentrate composition** comprising carbohydrate, amino acid, alkaline edible substance, and edible coating. No. 2,426,634. Daniel Melnick to Continental Foods, Inc.

**Bread improver** comprising mixture of chlorite, and edible carrier inert to chlorite. No. 2,426,736. Willis S. Hutchinson and Richard I. Derby to The Mathieson Alkali Works, Inc.

**Dehydration of foodstuffs with carbon dioxide.** No. 2,427,302. Gustave T. Reich.

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** U. S. Patents from Vol. 601, Nos. 3, 4, 5, Vol. 594, No. 1. Canadian from September 30 - October 21.*

**Producing acidified malt.** No. 2,427,323. Thomas Robert Dixon to The Enzymic Malt Company, Ltd.

**Improving gelling or thickening** properties of food product, consisting of complex of Irish moss and salt chosen from edible potassium and ammonium salts. No. 2,427,594. Alexander Frieden and Sanford Joseph Werbin to Stein Hall & Co., Inc.

**Covering for container for food** comprising central layer having coating of dichlorodiphenyl-trichloroethane thereon and layer adjacent to each side of central layer which retards passage of dichlorodiphenyltrichloroethane by evaporation. No. 2,427,647. Hans W. Vahlteich to The Best Foods, Inc.

## *Inorganic*

**Inhibiting hydrogen sulfide corrosion** *of metal* in presence of water comprising commingling small amount of water-soluble cyanide with water and hydrogen sulfide. No. 2,426,317. Paul L. Menaul to Stanolind Oil and Gas Company.

**Inhibiting corrosive attack** on metals, comprises mixing with fluid containing sulfide and normally having corrosive action upon metals, small proportion of organic compound at least partially soluble in fluid, containing characteristics aldehyde group, –CHO. No. 2,426,318. Paul L. Menaul to Stanolind Oil and Gas Company.

**Amines** of formula described in patent. No. 2,426,375. Murray Senkus to Commercial Solvents Corporation.

**Water-soluble glass** consisting of $K_2O$, $P_2O_5$ and $SiO_2$. No. 2,426,394. Ralph E. Hall and Casimir J. Munter to Hall Laboratories, Inc.

**Composition** consisting thirty-three and one-third parts by weight of boric acid, thirty-three and one-third parts litharge, nine parts lithium nitrate. No. 2,426,395. Kelsey I. Harvey.

**Producing ammonium sulfamate** comprising slowly mixing non-gaseous sulfur trioxide with amount of liquid ammonia in excess of that theoretically required for reaction while agitating rapidly. No. 2,426,420. Ernest J. Tauch to E. I. du Pont de Nemours & Company.

**Reactivation of metal sulfide catalysts selected from class consisting of** sulfides of W, Mo, Ni, W-Ni, W-Co, W-Fe, Mo-Ni, Mo-Co and Mo-Fe. No. 2,426,483. Herman G. Boucher and Thomas F. Leeds to Shell Development Company.

**Porous mechanically strong, sodium fluoride pellet.** No. 2,426,557. Kenneth E. Long and Harold W. Cromer to The Harshaw Chemical Company.

**Process for removing HF** from fluid containing same comprises absorbing HF in pellets of sodium fluoride, etc. No. 2,426,558. Kenneth E. Long and Harold W. Cromer to The Harshaw Chemical Company.

**Revivification of phosphate catalysts.** No. 2,426,678. Harry Greenberg to U. S. Industrial Chemicals, Inc.

**Preparation of silver catalysts comprises forming aqueous solution** containing silver nitrate and calcium nitrate, mixing with aqueous sodium oxalate solution, etc. No. 2,426,761. Adrien Cambron and Francis Leslie William McKim to The Honorary Advisory Council for Scientific and Industrial Research.

**Recovery of hydrogen fluoride.** No. 2,426,841. Claude C. Peavy and John Happel to Socony-Vacuum Oil Company, Inc.

**Purifying hydrochloric acid gas** containing free chlorine as impurity, step comprising catalytically reacting chlorine with carbon monoxide in presence of water vapor whereby chlorine is reduced to HCl. No. 2,426,914. Walter S. Allen to General Chemical Company.

**Production of titanium hydride,** improvement comprises placing charge of titanium dioxide pigment and calcium hydride in reaction zone, placing layer of absorbing material on top of charge, etc. No. 2,427,338. Peter P. Alexander to Metal Hydrides, Incorporated.

**Production of zirconium hydride,** improvement comprises placing charge of zirconium dioxide pigment and calcium hydride in reaction zone, placing layer of absorbing material on top of charge, gradually heating charge to temperature to dissociate calcium hydride into calcium and hydrogen gas to reduce zirconium dioxide in charge with calcium thus released to form metallic zirconium and calcium oxide, etc. No. 2,427,339. Peter P. Alexander to Metal Hydrides, Incorporated.

**Treating ferrous sulfate solutions** comprises treating solution with coke oven gas and thereby causing it to absorb sufficient ammonia to elevate its pH to from 7.0 to 7.5, etc. No. 2,427,555. Frank A. Elzi to The Colorado Fuel and Iron Corporation.

**New composition of matter,** powdered anhydrous tetrasodium pyrophosphate. No. 2,427,642. Adam G. Aitchison to Westvaco Chlorine Products Corporation.

## *Canadian*

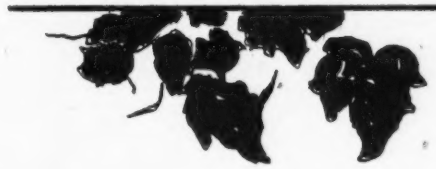
**As a new article of manufacture,** anhydrous monofluorophosphoric acid having the formula $H_2PO_3F$. No. 445,264. Ozark-Mahoning Co. (Willy Lange and Ralph Livingston).

**Method of producing anhydrous monofluorophosphoric acid.** No. 445,265. Ozark-Mahoning Co. (Willy Lange).

**Method of producing anhydrous fluorophosphoric acids.** No. 445,266. Ozark-Mahoning Co. (Willy Lange).

## *Medicinal*

**Preparation for combatting cocci infections,** comprises fatty oil solution of member of class consisting of alkyl, cycloalkyl-alkyl, aralkyl and heterocyclyl-alkyl esters of paranitrobenzoic acid, paranitro-thiol-benozic acid, and paramitro-thion-benzoic acid. No. 2,426,276. Werner Meiser to Winthrop Chemical Company, Inc.

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**Increasing stability of rendered crude fish liver oil** comprises heating organic solvent solution of such oil in contact with concentrated ammonium hydroxide, subsequently freeing oil of ammonia, water and solvent by heating mass under reduced pressure. No. 2,426,485. Loran O. Buxton and Charles E. Dryden to Nopco Chemical Company.

**Incorporating incompatible vitamins** in one product by adding one vitamin to hydrogenated vegetable oil having low melting point, adding another vitamin to hydrogenated vegetable oil having higher melting point, etc. No. 2,426,762. Milton Chanin to Scientific Nutrition Corporation.

## *Metals, Ores*

**Coating carbon base element with metallic selenium** comprises treating element with alkaline selenide solution. No. 2,426,173. Mortimer C. Bloom to Federal Telephone & Radio Corporation.

**Electrolytically forming protective film on magnesium object.** No. 2,426,254. Herbert Waterman to Turco Products, Inc.

**In depositing selenium layer of uniform thickness upon at least one surface** of metal base, improvement comprises steps of vaporizing selenium at atmospheric pressure, forming resulting vapors into thin ribbon-like stream in unadulterated vaporized form, etc. No. 2,426,377. Cleveland Scudder Smith, Jr., to Samuel Ruben.

**Apparatus for recovering highly oxidizable metal scrap** contaminated with volatilizable matter. No. 2,426,389. Frank D. Chew to Aluminum Company of America.

**Aqueous nickel plating bath comprising** grams per liter, nickel chloride 225 to 275, nickel sulfate 15 to 60, boric acid 45 to 60 and metasulfobenzaldehyde 4 to 10. No. 2,426,416. Ernest W. Schweikher to E. I. du Pont de Nemours & Company.

**Solder** containing 37½% gold and 62½% copper. No. 2,426,467. Richard B. Nelson to Gneeral Electric Company.

**Treating slags to recover metals,** improvement comprising reducer-mixer having chamber to subject slags to reduction and mixing. No. 2,426,607. Anton Martin to Falconbridge Nickel Mines, Limited.

**Thermally forming cavity in mineral material.** No. 2,426,688. Bryant H. Higgs to The Linde Air Products Company.

**Bright tempering steel** object without distortion of structure or impairment of surface. No. 2,426,773. Artemas F. Holden.

**Treatment of ferrous metal** comprises subjecting metal to noble gas. No. 2,426,814. George R. Burkhardt.

**Exothermic reaction mixture** suitable for use in providing slag layers on surfaces of molten metal in casting and ingot molds to inhibit or reduce pipings. No. 2,426,849. Marvin J. Udy.

**Casting light metal** into mold cavities at least portion of the surfaces of which are provided with coating containing binder and inorganic insulator material, improvement consisting in facing coating with layer of compound selected from magnesium sulphate and alkali metal sulphate. No. 2,426,987. Walter A. Dean to Aluminum Company of America.

**In coating of mold cavities** into which molten light metal is to be cast, improvement consisting in providing on at least part of mold cavity surfaces coating comprising binder of soluble stable phosphate and inorganic insulator material applying to coating thus formed superficial layer of soluble stable phosphate. No. 2,426,988. Walter A. Dean to Aluminum Company of America.

**Nickel plating composition** for dissolving in water to make aqueous plating bath comprising nickel chloride, nickel sulfate and 2-phenyl ethylene sulfonic acid. No. 2,427,280. Raymond A. Hoffman to E. I. du Pont de Nemours & Company.

**Metal coating metal pipes** by electric fusion. No. 2,427,350. Otis R. Carpenter and Howard J. Kerr to The Babcock & Wilcox Company.

**Treating material containing columbium and tantalum.** No. 2,427,360. William J. Kroll and Frederick E. Bacon to Electro Metallurgical Company.

**Apparatus for dry separation of minerals.** No. 2,427,423. George E. Shawcross one-half to Saxon Engineering Company, Limited.

### *Canadian*

**Water-expanded montmorillonitic clay that has been dried without substantial shrinkage,** and which is in the form of a fluffy, adsorbent solid. No. 444,722. American Colloid Co. (Paul Bechtner).

**Method of increasing the resistance to corrosion** in the manufacture of stainless steel. No. 444,777. Uddeholms A. B. (Arved Eduard Gaston Theopil von Vegesack).

**In the concentration of ores containing a silicious gangue by flotation,** the step of adding to the pulp a small amount of an organic compound which will form an undissociable inner complex (cyclic chelate compound) of water-soluble or hydrophilic character. No. 444,836. The Dorr Co. (Gregoire Gutzeit).

**Method of recovering beryllium values** in the form of beryllium fluoride from siliceous beryllium ores. No. 444,933. Aluminum Company of America (Charles Blake Willmore and Frank Dubois Chew).

**Method of recovering beryllium values** in the form of beryllium fluoride from siliceous beryllium ores. No. 444,934. Aluminum Company of America (Charles Blake Willmore and Frank Dubois Chew).

**Process for producing magnesium containing beryllium comprising** producing magnesium and beryllium fluoride vapours, condensing and melting the resulting condensate. No. 444,935. Aluminum Company of America (Charles Blake Willmore and Frank Dubois Chew).

**Producing soft iron powder** by mixing cast iron particles with an alkali metal-containing oxidizing agent and heating to remove carbon. No. 444,960. Ferrum, Ltd. (Horace Freeman).

## *Organic*

**Composition consisting of hydrocarbon material** subject to deterioration by atmospheric oxygen having incorporated therein small amount, to inhibit such deterioration, of product having aldehyde group, formed by reacting p-cresol with isobutene in presence of catalytic amount of sulfuric acid of 96% concentration. No. 22,909. Warren M. Smith and Carroll J. Wilson to Standard Oil Development Company.

**Aliphatic nitro derivatives** of cyanoacetic esters and method for preparing. No. 2,426,158. Carl T. Bahner.

**1-methylolcyclohexyl-cyclohexyl-carbinol di-acetate.** No. 2,426,162. Joseph E. Bludworth and Donald P. Easter to Celanese Corporation of America.

**Preparing halogenated ethane** in which at least two halogen atoms are fluorine. No. 2,426,172. Anthony F. Benning to Kinetic Chemicals, Inc.

**Condensation products of tri-(beta-aminoethyl)-amine** and ortho hydroxy aromatic carbonyls. No. 2,426,206. Lyle A. Hamilton and Charles J. Pedersen to E. I. du Pont de Nemours & Company.

**Producing dibasic acids** and derivatives of dibasic acids. No. 2,426,224. Morris S. Kharasch to Eli Lilly and Company.

**Making allyl alcohol** comprises passing propylene oxide vapors over catalyst composed of trilithium phosphate at 200° to 300°C. No. 2,426,264. George W. Fowler and John T. Fitzpatrick to Carbide and Carbon Chemicals Corporation.

**Preparing quaternary ammonium salts.** No. 2,426,293. Gerhard Balle, Johann Rosenbach and Ludwig Orthner to General Aniline & Film Corp.

**Azo benzene 4,4'-disulfonamido thiazole.** No. 2,426,313. Bernard J. Ludwig and Franz C. Schmelkes to Wallace & Tiernan Products, Inc.

**Acylated mono-amine** in which amine radical is that of amine selected from group consisting of primary and secondary aliphatic, aralkyl, and alkyl-alicyclic amines having at least one aliphatic hydrocarbon radical containing from 8 to 32 carbon atoms. No. 2,426,338. Charles M. Blair, Jr., to Petrolite Corporation, Ltd.

**Manufacture of unsubstituted 2-mercapto-thiazole.** No. 2,426,397. Paul C. Jones to The B. F. Goodrich Company.

**Fluid consisting of liquid solution** of bromo-benzene and pseudo cumene in proportions to have viscosity at −40°F of 3.68 and at 100°F of 1.20. No. 2,426,407. John D. Morgan and Russell E. Lowe to Cities Service Oil Company.

**Separating product enriched in 2,4,6-collidine** from mixture containing this base and other like-boiling nitrogen bases. No. 2,426,442. Karl Henry Engel to Allied Chemical & Dye Corporation.

**Making butadiene** comprises reacting substance selected from dimethyl acetal, dibenzyl acetal, vinyl methyl ether and vinyl benzyl ether, with ethylene at under 250°C in presence of selected dehydrative catalyst containing less than 10% of its weight of noble metal as condensing agent. No. 2,426,450. William J. Hale and Harry Miller to National Agrol Company, Inc.

**Preparing N-vinylcarbazole.** No. 2,426,465. Harry F. Miller and Ralph G. Flowers to General Electric Company.

**Composition comprising** between 0.01% and 5% of di(tertiary alkyl) peroxide and unsaturated polymerizable compound containing non-aromatic group. No. 2,426,476. William E. Vaughan and Frederick F. Rust to Shell Development Company.

**Oxidized dimer of 9,11-linolo-diricin-olein** and method of making same. No. 2,426,489. Melvin De Groote to Petrolite Corporation, Ltd.

**Hydroxyacetylated and oxidized dimer of 9,11-linolo-diricinolein,** and method of making same. No. 2,426,490. Melvin De Groote to Petrolite Corporation, Ltd.

**Sulfonic acid derivatives of anthraquinone** compound of general formula described in patent. No. 2,426,547. Gerard Dunstan Buckley and Henry Alfred Piggott to Imperial Chemical Industries, Limited.

**Alkylation of isoparaffins** by means of normal olefins in presence of hydrofluoric acid. No. 2,426,559. Maryan P. Matuszak to Phillips Petroleum Company.

**Chlorinated-aliphatic ether of amino-diphenylamines.** No. 2,426,576. John P. Goulding, Robert P. Parker and John J. Denton to American Cyanamid Company.

**2-alkyl-1-alkylaminoanthraquinones** and mixtures thereof having formula described in patent. No. 2,426,577. Mario Scalera and William B. Hardy to American Cyanamid Company.

**Organometallic salt** produced by reaction of water-soluble salt of metal with alkali metal salt of N-methylene dithiocarbamic acid and alkali metal salt of organic sulfhydryl. No. 2,426,586. Adolph J. Beber to The B. F. Goodrich Company.

**In making tetraethyl lead,** improvement comprises carrying out reaction in presence of anhydride of carboxylic acid. No. 2,426,598. Willis Jackson Clem and Herman Podolsky to E. I. du Pont de Nemours & Company.

**Removal of acetylenic hydrocarbons from diolefine-containing mixtures.** No. 2,426,604. Ludo K. Frevel to The Dow Chemical Company.

**Separating quinonoid hydrocarbon** from benzenoid hydrocarbon, comprises extracting hydrocarbons with anhydrous hydrogen fluoride, separating extract of quinonoid hydrocarbon in liquid hydrogen fluoride. No. 2,426,624. Arthur P. Lien to Standard Oil Company.

**Preparing $CCl_2F_2$** comprises passing anhydrous chlorofluoromethane, through anhydrous aluminum halide catalyst. No. 2,426,637. William S. Murray to E. I. du Pont de Nemours & Company.

**Preparing $CHF_3$** comprises passing anhydrous chlorofluoromethane in contact with anhydrous aluminum halide catalyst. No. 2,426,638. William S. Murray to E. I. du Pont de Nemours & Company.

**In catalytic reaction of olefins with hydrogen sulphide,** improvement comprises conducting reaction in presence of synthetic gel catalyst. No. 2,426,646. Walter A. Schulze to Phillips Petroleum Company.

**In formation of organic sulfur compounds,** improvement comprises conducting addition reaction in presence of liquid catalyst comprising boron fluoride and oxygen-containing acid of phosphorus. No. 2,426,647. Walter A. Schulze and Willie W. Crouch to Phillips Petroleum Company.

**In formation of organic sulfur compounds,** improvement comprises conducting addition reaction in presence of liquid catalyst complex comprising boron fluoride and water. No. 2,426,648. Walter A. Schulze and Willie W. Crouch to Phillips Petroleum Company.

**Converting cellulose into sugar** comprises adding concentrated acid to cellulosic material, subjecting acid-material mixture to grinding-mixing-pressure action. No. 2,426,677. Ellis I. Fulmer and John W. Dunning and Ralph H. Fash to Anderson, Clayton & Co.

**Manufacturing trimethyl phosphate** comprises reacting methyl alcohol with phosphorus trichloride, chlorinating product, etc. No. 2,426,691. Russell L. Jenkins to Monsanto Chemical Company.

**Improved process for separation of isoprene** of high purity from hydrocarbon fraction rich in $C_5$ hydrocarbons. No. 2,426,705. John A. Patterson and Harold W. Scheeline to Standard Oil Development Company.

**Segregation of olefinic hydrocarbons by extractive distillation.** No. 2,426,706. John A. Patterson to Standard Oil Development Company.

**Esters of endoethylene-substituted cyclopentanols.** No. 2,426,725. Herman A. Bruson to The Resinous Products & Chemical Company.

**Suppressing catalytic effect** of metal compounds on olefinic distillates, comprises adding to distillate small amount of 2-hydroxy-1-naphthylidene-or-tho-aminophenol. No. 2,426,766. Frederick B. Downing and Charles J. Pedersen to E. I. du Pont de Nemours & Company.

**Purification of tetra ethyl lead.** No. 2,426,789. Alfred E. Parmelee to E. I. du Pont de Nemours & Company.

**Chloro-methylene derivative of fatty acid amides.** No. 2,426,790. Josef Piki to E. I. du Pont de Nemours & Company.

**Process for separating isoprene and mono-olefins having boiling temperatures close to isoprene.** No. 2,426,821. Theodore W. Evans, Rupert C. Morris and Edward C. Shokal to Shell Development Company.

**Polymerizing chloroprene** in aqueous emulsion in presence of water soluble salt of acid peroxide and compound of sulfonic acids of anthraquinone and their water soluble salts. No. 2,426,854. Paul O. Bare to E. I. du Pont de Nemours & Company.

**Diallyl ether of 2-butene-1,4-diol.** No. 2,426,863. George F. Deebel to Monsanto Chemical Company.

**Compound sulfanilyldicyandiamide.** No. 2,426,882. Donald W. Kaiser and Jack T. Thurston to American Cyanamid Company.

**N-substituted alpha-oxyacetamides and insect combating compositions.** No. 2,426,885. Lowell B. Kilgore.

**N,N'-dioctadecyl-beta-amino-propionamide.** No. 2,426,891. Kathryn L. Lynch to American Cyanamid Company.

**Butylene dehydrogenation process.** No. 2,426,893. Maurice W. Mayer to Standard Oil Development Company.

**Bis(2-ethylhexyl) chloromaleate.** No. 2,426,902. Raymond B. Seymour to Monsanto Chemical Company.

**Process of hydrolyzing dimethyldihalogenosilanes.** No. 2,426,912. James G. E. Wright to General Electric Company.

**Production of dimers and trimers** of beta-gamma olefinic alcohol of aliphatic character. No. 2,426,913. David E. Adelson and Harold F. Gray, Jr., to Shell Development Company.

**Hydrogenation of liquid carbonaceous materials.** No. 2,426,929. Bernard S. Greensfelder to Shell Development Company.

**Oxidizing unsaturated fatty residues** comprising sulfating residues, treating with nitric acid in the presence of manganese compound. No. 2,426,954. Francis J. Sprules and Richard Griffith to Nopco Chemical Company.

**Preparing metaldehyde,** comprises polymerizing acetaldehyde in presence of acidic polymerization catalyst and aliphatic ether and recovering precipitated metaldehyde by filtration. No. 2,426,961. Richard S. Wilder to Publicker Industries, Inc.

**Esterifying polyhydric organic compounds.** No. 2,426,968. Henry W. Grubb, Leo M. O'Hara and Kenton Atwood to Joseph E. Seagram & Sons, Inc.

**Production of cellulose esters** wherein cellulose is esterified in excess of lower fatty acid anhydride in solvent for ester containing catalyst and at a temperature not in excess of 30°C, etc. No. 2,426,982. Alvah Dale Clark and William F. Reichert to American Viscose Corporation.

**Sulphur cured dihydroxyalkane-dicarboxy-alkane-dicarboxyolefin polyester.** No. 2,426,994. Carl J. Frosch to Bell Telephone Laboratories, Inc.

**Heptafluoromonochlorocyclobutane** and process of making. No. 2,427,116. Paul L. Barrick to E. I. du Pont de Nemours & Company.

**Artificial waxes** comprising reaction products of maleic anhydride and partial esters of stearic acid and polyhydric alcohols of pentaerythritol series, methods for preparing and compositions containing. No. 2,427,255. Harry Burrell, Philip I. Bowman and Robert H. Barth to Hayden Chemical Corporation.

**Producing high-boiling mercaptans.** No. 2,427,309. Walter A. Schulze to Phillips Petroleum Company.

**Preparing guanamine** comprises reacting biguanide with ester of aromatic carboxylic acid in presence of metal alkoxide in stoichiometric proportions. No. 2,427,314. Jack Theo Thurston to American Cyanamid Company.

**Making salts of carboxy polymethylene guanamines.** No. 2,427,315. Jack Theo Thurston to American Cyanamid Company.

**Unsaturated carboxy guanamines.** No. 2,427,316. Jack Theo Thurston and Daniel Elmer Nagy to American Cyanamid Company.

**Pregelatinized waxy starch.** No. 2,427,328. Herman H. Schopmeyer and George E. Felton to American Maize-Products Company.

**Monovinylfluorene and method of preparing.** No. 2,427,337. Royal K. Abbott, Jr., and Edward A. Kern to General Electric Company.

**6,6 dimethyl norpinane-2-acetaldehyde.** No. 2,427,343. Joseph P. Bain to The Glidden Company.

**Acid of norpinane series.** No. 2,427,344. Joseph P. Bain to The Glidden Company.

**Hydrogenating double bond of dicyclic primary alcohol** formed by condensing anhydrous formaldehyde with nopinene at 100 to 225°C whereby B(6,6 dimethyl norpinane-2-) ethanol is formed. No. 2,427,345. Joseph Paul Bain to The Glidden Company.

**Preparing esters of 6-alkoxy-i-bisnorcholenic acids** comprises ozonizing i-stigmasteryl methyl ether and esterifying resulting 6-methoxy-i-bisnorcholenic acid. No. 2,427,368. Byron Riegel and Edwin W. Meyer, Romeo W. Gouley and John Beiswanger—Riegel and Meyer and Beiswanger to The Glidden Company.

**Continuous process of producing nicotinamide.** No. 2,427,400. Paul W. Garbo.

**Preparation of cellulose acetate,** comprises acetylating cellulose by means of acetic anhydride in presence of acetic acid as solvent and from 9 to 15% of sulfuric acid on weight of cellulose as catalyst, etc. No. 2,427,403. Clifford I. Haney and Mervin E. Martin and Arnold J. Rosenthal to Celanese Corporation of America.

**Producing piperazines from aliphatic hydroxy amines.** No. 2,427,473. Harry Fred Pfann to American Cyanamid Company.

**Production of chloracrolein** comprises pyrolysing 5,chlor-2,3-dihydropyran in vapour phase at 350°C-500°C. No. 2,427,492. John George Mackay Bremner and David Gwyn Jones to Imperial Chemical Industries, Limited.

**Isomerizing allo-ocimene** by heating its vapor at 300° to 500°C for 60 to 0.1 seconds. No. 2,427,497. Leo A. Goldblatt.

**Curing aldehyde-reactive prolamine-base protein.** No. 2,427,503. Willard L. Morgan to American Maise-Products Company.

**Curing aldehyde-reactive prolamine-base protein.** No. 2,427,504. Willard L. Morgan to American Maize-Products Company.

**Composition of matter** comprising condensation product of ingredients comprising 0.5-4 molecular proportions of primary mono-amino-diphenyl free from aldehyde-reactive substituents, and one molecular proportion of addition product of 1-4 molecular proportions of aldehyde with one molecular proportion of dicyandiamide. No. 2,427,514. Milton J. Scott to Monsanto Chemical Company.

**Reacting, in alkaline conditions,** polyhalogen alkyl sulphonate with aliphatic alcohol compound of group consisting of alcoholates and alcohols. No. 2,427,576. Ralph Carlisle Smith to Colgate-Palmolive-Peet Company.

**Reacting, in alkaline condition,** epoxy alkyl sulphonate with aliphatic alcohol compound of group consisting of alcoholates and alcohols. No. 2,427,577. Ralph Carlisle Smith to Colgate-Palmolive-Peet Company.

**3-substituted 4-hydroxycoumarin** and process of making it. No. 2,427,578. Mark A. Stahmann and Miyoshi Ikawa and Karl Paul Link to Wisconsin Alumni Research Foundation.

**3,4-dihydropyranocoumarins and process of making them.** No. 2,427,579. Mark A. Stahmann, Miyoshi Ikawa and Paul Link to Wisconsin Alumni Research Foundation.

**Obtaining beta (acylthio) oxo compound** comprises admixing at below 100°C aliphatic compound, whose sole functional groups are an oxo group and ethylenic unsaturation conjugated therewith, with at least one mol of aliphatic monocarbothiolic acid per ethylenic double bond in aliphatic oxo compound, etc. No. 2,427,582. William H. Vinton to E. I. du Pont de Nemours & Company.

**Production of organic nitrile** taken from group consisting of acrylonitrile and succinonitrile. No. 2,427,601. Charles R. Harris to E. I du Pont de Nemours & Company.

**Preparing mixtures of alkylhalogenosilanes** containing trialkylhalogenosilane comprises effecting reaction between heated silicon and lower alkyl halide in presence of metal selected from aluminum and zinc. No. 2,427,605. Dallas T. Hurd to General Electric Company.

**Preparing barium dicyanimide.** No. 2,427,619. Daniel E. Nagy and Bryan C. Redmon to American Cyanamid Company.

**Photochemical process** for production of trichloracetyl chloride. No. 2,427,624. Arnold Rushmer and William Watson Smith to Imperial Chemical Industries, Limited.

**Polymerizable diester of sulfonyl diglycolic acid** with aliphatic beta mono-olefinic mino-hydroxy primary alcohol of not more than 18 carbon atoms per molecule having terminal methylene group. No. 2,427,640. Lynwood N. Whitehill and Edward C. Shokal to Shell Development Company.

## *Canadian*

**Method of preparing oil-soluble phenolic condensation products.** No. 444,723. American Cyanamid Co. (Robert C. Swain and Pierrepont Adams).

**Process for the manufacture of melamine suitable for lacquer manufacture.** No. 444,724. American Cyanamid Co. (Victor L. King).

**Resinous composition** comprising the heat reaction product of mono-ortho-amino-diphenyl and an addition product of formaldehyde with melamine. No. 444,753. Monsanto Chemical Co. (Milton John Scott).

**Manufacture of derivatives of arylacetonitrils.** No. 444,763. Roche Products, Ltd. (Franz Bergel, Nathan Chadwick Hindley, Alexander Lang Morrison and Heinrich Rinderknecht).

**Method of crystallizing nitroguanidine.** No. 444,852. Imperial Chemical Industries (Harry Jackson and Frank Douglas Miles).

**Polymerizing indene substantially free from coumarone** by contacting with a catalyst selected from the group consisting of alkyl and aryl acid sulphates under temperature conditions not exceeding approximately 50°C. No. 444,888. The United Gas Improvement Co. (Frank John Soday).

**An accelerator compound** consisting of a pulverulent mixture of benzo thiazyl disulphide and zinc stearate. No. 444,889. R. T. Vanderbilt Co., Inc. (Ernest B. Curtis).

**Method of preparing (4, 6-diamino pyrimidyl-2 thio methyl) methyl ketone.** No. 444,950. Canadian General Electric Co., Ltd. (Gaetano F. D'Alelio and James W. Underwood).

**Method of preparing beta, beta-bis-(4,6-diamino pyrimidyl-2 thio) diethyl ether.** No. 444,951. Canadian General Electric Co., Ltd. (Gaetano F. D'Alelio and James W. Underwood).

**Alpha, beta, dimethyl, beta chloro acrylonitrile.** No. 445,024. Wingfoot Corp. (Joy Gabriel Lichty).

**Producing styrenes and the like from asymmetric diaryl substituted paraffins.** No. 445,092. Dominion Tar & Chemical Co., Ltd. (Murray Gray Sturrock and Thomas Lawe).

**Producing mononuclear aromatic compounds by heating asymmetric diaryl** substituted paraffins at a temperature of at least 350°C., mixing with a diluent and passing through a catalyst which promotes simple molecular decomposition and which is a hydrated aluminum silicate. No. 445,093. Dominion Tar & Chemical Co., Ltd. (Murray Gray Sturrock and Thomas Lawe).

**A method of condensation** which comprises reacting an aliphatic aldehyde with benzene, naphthalene or their substituted derivatives in the presence of fluosulphonic acid at a temperature of minus 30 to plus 100°C. No. 445,094. Dominion Tar & Chemical Co., Ltd. (Woodrow Ernest Kemp).

**Process** which comprises heating a paraffin having at least two carbon atoms and having two aryl substituents attached to one of said carbon atoms to decompose into a plurality of aromatic compounds in the presence of a catalyst. No. 445,095. Dominion Tar & Chemical Co., Ltd. (Murray Gray Sturrock and Thomas Lawe).

**Producing a reaction product,** of 4,4-diaminodiphenyl sulphone with two molecular equilavents of formaldehyde for each amino group in the 4, 4-diaminodiphenyl sulphone. No. 445,117. Eli Lilly and Co. (Morris S. Kharasch and Otto Reinmuth).

**Process for the preparation of 21 (p-aminobenzene-sulphonamido)- pyridine.** No. 445,118. May & Baker, Ltd. (Arthur James Ewins and Montague Alexander Phillips).

**Process for the preparation of 2-(p-aminobenzene-sulphonamido)-thiazole.** No. 445,119. May & Baker, Ltd. (George Newbery).

**Process for the production of bis (beta-chlor allyl) ether.** No. 445,148. Shell Development Co. (George W. Hearne and Donald S. La France).

**Process for preparing cyclohexyl methyl ketone** from butadiene and methyl vinyl ketone. No. 445,149. Shell Development Co. (Rupert C. Morris and Theodore W. Evans).

**Process for the production of beta-bromacrylic acid.** No. 445,279. Shell Development Co. (Harry de V. Finch, El Cerrito and Seaver A. Ballard).

## *Packaging*

**Portable sealed package** containing gaseous oxygen at 700 psi to be dispensed from container. No. 2,426,630. Daniel Mapes to Specialties Development Corporation.

**Liquidproof container.** No. 2,426,797. Joseph P. Stein.

## *Paints, Pigments*

**Producing rutile pigment** comprises preparing titanium tetrachloride solu-

tion introducing solution into water, etc. No. 2,426,788. David B. Pall to American Cyanamid Company.

**Preparation of rutile titanium dioxide** of improved color from hydrolysates which normally calcine to anatase comprises filtering and washing such hydrolysates, adding to filter cake seeding agent for converting anatase to rutile, etc. No. 2,427,165. Charles A. Tanner, Jr., and Winfred J. Cauwenberg.

**Emulsifier** for rendering water-thinnable the concentrates of paints, varnishes, enamels, lacquers, shellacs and the like non-aqueous water immiscible coating compositions. No. 2,427,481. Glenn B. Weible and Robert J. Burns to Lockheed Aircraft Corporation.

## *Paper, Pulp*

**Hydrating paper stock** without cutting or shortening fibers. No. 2,426,923. Edwin Cowles to The Cowles Company.

## *Petroleum*

**Mineral oil lubricant composition** containing small proportion of thymol to inhibit oxidation and small rust-preventive proportion of substance comprising substituted 1,2-dihydroxy-benzene having as substituent saturated aliphatic hydrocarbon group attached to benzene ring in para position and containing 4-12 carbon atoms. No. 2,426,549. Walter J. Coppock to Sun Oil Company.

**Lubricating composition** of lubricating oil base having product formed by reacting p-cresol with agent in presence of sulfuric acid. No. 22,910. John G. McNab, Carroll J. Wilson and Carl Winning to Standard Oil Development Company.

**Lubricant** comprising mineral lubricating oil and substances selected from sulfurized-phosphorized and phosphorized fatty material and organic polysulfides. No. 22,911. Joseph B. Stucker to The Pure Oil Company.

**Alkylation of low-boiling paraffin hydrocarbon** with low-boiling olefin using liquid acid alkylation catalyst. No. 2,426,611. Thomas B. Hudson, I. Louis Wolk, and John D. Upham to Phillips Petroleum Company.

**Alkylation process** comprises reacting aromatic hydrocarbon with olefinic hydrocarbon in presence of catalyst comprising aluminum halide and zinc halide. No. 2,426,665. Herman S. Bloch to Universal Oil Products Company.

**Stabilized motor fuel** comprising gasoline tending to deteriorate on storage containing unsaturated fatty acid and phenol. No. 2,426,709. Thomas Carl Roddy, Jr. to The Texas Company.

**Production of toluene from naphthenic petroleum** distillates by hydroforming of selected fraction. No. 2,426,824. Donald L. Fuller and Bernard S. Greensfelder to Shell Development Company.

**Dehydrogenating hydrocarbon** of mono-olefins and alkylated aromatics. No. 2,426,829. Kenneth K. Kearby to Standard Oil Development Company.

**Cracking hydrocarbons** in vapor phase, comprises distilling from petroleum stock fractions which volatilize below coking temperature, etc. No. 2,426,848. Malcolm H. Tuttle to Max B. Miller & Co., Inc.

**Method of lubricating hot metal surfaces** which in absence of lubricant, would move at temperatures above 500°F. No. 2,426,852. Donald L. Wright to Jasco, Inc.

**Simultaneously dehydrogenating naphthenes and hydrogenating olefins.** No. 2,426,870. Ralph M. Hill to Standard Oil Development Company.

**Effecting continuous catalytic cracking** on recycle basis while maintaining carbon ratio in recycled stream which is at least as high as hydrogen; carbon ratio of incoming charging stock. No. 2,427,009. Arthur P. Lien, Bernard L. Evering and Bernard H. Shoemaker to Standard Oil Company.

**Removing weakly acidic substances** from oils comprises extracting oils with aqueous solution of caustic alkali and alkali metal salt of N-substituted amino acid in which amino nitrogen is attached to at least one hydrocarbon radical. No. 2,427,083. Chester E. Adams and Theodore B. Tom to Standard Oil Company.

**Catalytic process** for conversion of hydrocarbon oils in which solid conversion catalyst in subdivided form is continuously recirculated through conversion zone, etc. No. 2,427,112. Charles W. Tyson to Standard Oil Development Company.

**Leaded-gasoline** containing small amount of at least one of group consisting of trimethyl phosphate and trimethyl phosphite. No. 2,427,173. Lloyd L. Withrow to General Motors Corporation.

**Removing peroxides** from hydrocarbon oil which has deteriorated during storage consisting in contacting oil with alkali solution containing phenolic substance capable of being oxidized to quinone structure. No. 2,427,212. Lawrence M. Henderson, Donald C. Bond and Michael Savoy to The Pure Oil Company.

**Sweetening hydrocarbon liquid** containing mercaptans comprising contacting liquid with sufficient aqueous alkali solution containing free alkali metal hydroxide and solubility promoter to extract major portion of mercaptans from liquid, etc. No. 2,427,250. Donald C. Bond to The Pure Oil Company.

**Improved mineral oil composition** comprising major proportion of viscous mineral oil fraction having in admixture therewith small amount to enhance stability of oil fraction of oil-soluble, phosphorus- and sulfur-containing material. No. 2,427,272. Everett W. Fuller, Horace E. Redman and Henry G. Berger to Socony-Vacuum Oil Company, Inc.

**Improved process for producing low-boiling normally liquid paraffin** hydrocarbons from mixture comprising isobutene and a normal butene. No. 2,427,293. Maryan P. Matuszak to Phillips Petroleum Company.

**Separating mineral oil emulsions** of water-in-oil type into their constituent parts, comprises subjecting emulsion to action of emulsion breaker includes colloidally active organic substance which tends to stabilize emulsions of oil-in-water type, water, and urea. No. 2,427,326. Paul M. Goodloe, II, and Thomas T. Noland to Socony-Vacuum Oil Company, Inc.

**Improved mineral oil composition** comprises petroleum lubricating oil fraction with which there has been compounded minor proportions, to retard rusting, of alpha, alpha'-thiodilauric acid and alpha-hydroxylauric acid. No. 2,427,501. Milton P. Kleinholz to Sinclair Refining Company.

**Refining hydrocarbon oil** with sludge-forming reagent. No. 2,427,589. Vladimir L. Chechot to The Atlantic Refining Company.

### *Canadian*

**Emulsifiable oil** which is substantially non-foaming when agitated with water. No. 445,037. Otto Norring.

**Breaking petroleum emulsions** of the water-in-oil type by subjecting to the action of a demulsifying agent containing a trinitrophenol. No. 445,077. American Cyanamid Co. (Charles F. Bonnet).

## *Photographic*

**Printing photographic image** by means of light rays onto radiation-sensitive elements. No. 2,426,894. David Malcolm McQueen to E. I. du Pont de Nemours & Company.

**Photographic gelatino-silver-halide emulsion.** No. 2,427,177. Alfred W. Anish to General Aniline & Film Corporation.

## *Polymers*

**Improved vinyl acetate-vinyl chloride** copolymer resin composition. No. 2,426,316. Frank S. Martin to United State Rubber Company.

**Molecularly oriented copolymers of acrylonitrile** saturated monohydric alcohol ester of ethylene alpha beta di-carboxylic acid and acrylic esters or vinyl ethers. No. 2,426,728. Gaetano F. D'Alelio to Prophy-lac-tic Brush Company.

**Curing sheeted heat-curable plastic material,** comprises passing sheeted material through heating chamber heating curing temperature, and cooling. No. 2,426,775. Frederic A. Lang to E. I. du Pont de Nemours & Company.

**Butadiene-styrene copolymer** plasticized with metallic drier and ketone or aldehyde. No. 2,427,063. Charles Joseph Mighton and Herman Elbert Schroeder to E. I. du Pont de Nemours & Company.

**Vulcanizing plasticized polymer composition** having as base polymer prepared by polymerization of monomeric material consisting predominantly of halogenated ethylene containing from one to two halogen atoms on one only of carbon atoms. No. 2,427,070. Louis F. Reuter to The B. F. Goodrich Company.

**Vulcanization of vinyl resins.** No. 2,427,071. Louis F. Reuter to The B. F. Goodrich Company.

**Composition of matter** comprising mixture of 5% to 30% of finely divided dry solid polyisobutylene polymer chlorinated to contain from 40% to 80% of chlorine, with 95% to 70% of pulverized petroleum coke. No. 2,427,077. Allan L. Tarr and George W. Oxley to Standard Oil Development Company.

**Depolymerizing allo-ocimene polymers.** No. 2,427,506. Dorothy M. Oldroyd, Theodore R. Savich and Leo A. Goldblatt.

**Dispersing copolymer of vinyl chloride** and vinyl acetate in ketone and hydrocarbon dispersant. No. 2,427,514. Clayton I. Spessard to Carbide and Carbon Chemicals Corporation.

## *Processes and Methods*

**Catalytic cracking of hydrocarbons.** No. 2,426,273. Warren W. Johnstone to Universal Oil Products Company.

**Apparatus for use in treating skins** comprising chamber in which skins are to be placed in stack header tank for reagent to be used in treatment, means for propelling reagent through chamber in direction from edge to edge of skins, etc. No. 2,426,372. Paul Poser.

**Reducing corrosive action of Friedel-Crafts type catalyst.** No. 2,426,693. Wynkoop Kiersted, Jr. to The Texas Company.

**Preparing improved durable catalytic** composition containing mercury oxide combined with oxide of nitrogen comprises impregnating charcoal with mercury nitrate solution, roasting, cooling and recovering catalytic composition. No. 2,426,792. Leroy Frank Salisbury to E. I. du Pont de Nemours & Company.

**Continuous process of making tapered bristles.** No. 2,426,896. Harvey A. Neville and Thomas G. Harris to Devoe & Raynolds Company, Inc.

**Determining amounts of foreign matter** of different kinds buried in mass of non-transparent material, comprises submerging material in liquid having same index of refraction as that of material, transmitting light through submerged material to display foreign matter, etc. No. 2,427,435. Herbert J. Wollner to Baird Associates, Inc.

**Impingement process** for producing carbon black. No. 2,427,509. William E. Reardon to Columbian Carbon Company.

### *Canadian*

**Processing a carbon electrode** comprising the step of immersing the electrode in liquid nitrogen until boiling ceases. No. 445,085. Canadian General Electric Co., Ltd. (Henry A. Kent).

**In scrubbing acidic gases** from gaseous mixtures by the action of an aqueous solution containing organic bases, preventing foaming of the solution by adding oleyl alcohol. No. 445,112. The Girdler Corp. (Robert M. Reed).

## *Rubber*

**Making vulcanizates** of vulcanizable butadiene styrene copolymer com-

prises compounding copolymer with vulcanizing agent, paracoumarone resin and filler. No. 2,426,165. Theodore A. Bulifant to Allied Chemical & Dye Corporation.

Continuous vulcanization of insulated electrical conductors. No. 2,426,341. Charles M. Canfield to General Cable Corporation.

Synthetic rubber-like material being copolymer containing from 85% to 97% of fluoro-1,3-butadiene and from 15% to 3% of (1-alken-3-yl) ethinyl carbinol. No. 2,426,560. Walter E. Mochel to E. I. du Pont de Nemours & Company.

Vulcanizing rubber in presence of elemental sulfur and mixed organometallic salt having formula described in patent. No. 2,426,855. Adolph J. Beber to The B. F. Goodrich Company.

Producing polysulfide rubber of low water permeability. No. 2,426,916. Naaman F. Barr and Wallace K. Schneider to Stoner-Mudge, Inc.

Producing polysulfide rubber of low-water permeability. No. 2,426,917. Naaman F. Barr and Wallace K. Schneider to Stoner-Mudge, Inc.

Synthetic rubber comprising blend of rubbery copolymer of butadiene and styrene, and curable chloroprene polymer. No. 2,427,192. Joseph F. Brovsky to Gates Rubber Company.

Adhering vulcanizable composition surface to metallic surface. No. 2,427,196. Thomas K. Cos to Western Electric Company, Inc.

Bonding surfaces of vulcanizable compounds, one of which compounds contains polymerized chloroprene as vulcanizable ingredient and other of which contains material of group consisting of rubber and polymerized chloroprene as vulcanizable ingredient, etc. No. 2,427,197. Thomas K. Cos to Western Electric Company, Inc.

Reducing rate of cure of rubber-like copolymer of major proportion of mono-olefine and minor proportion of diolefine vulcanized with oxidizing agent, and rubber vulcanizing agent which is quinone dioximino compound selected from quinone dioximes, and esters thereof. No. 2,427,514. Robert R. Sterrett and Frederic L. Holbrook to United States Rubber Company.

Rubber latex extended with aqueous emulsion of cracked gasoline distillate polymer resin. No. 2,427,532. John J. Miskel to Nopco Chemical Company.

Rubber latex base liquid sealing compound possessing thixotropic and gelling-on-heating properties. No. 2,427,618. Harold W. Nagle and Julius H. Haines to Mimex Company, Inc.

## *Specialties*

Ink consisting of 90 parts by weight butyl carbitol, 10 parts printing ink varnish, dioctyl sodium succinate and methyl violet, respectively, in 0.2% and 10%, of combined solvents. No. 2,426,194. Adolph Fischbach and Maurice Friedman.

Insecticidal composition including insecticidal kerosene fraction of mineral oil and aluminum salt of group consisting of aluminum stearates, aluminum palmitate, and aluminum oleate, aluminum salt being mixed with lower boiling alcohol, glycol or glycerine. No. 2,426,214. Charles K. Hewes to Richfield Oil Corporation.

In manufacture of carbon inks, step of incorporating oxidized wax, which contains fatty acids of chain lengths ot from twenty to thirty carbon atoms into carbon black in oil. No. 2,426,248. Nathan Sugarman to The Standard Register Company.

Adhesive tape comprising flexible sheet backing having on one side pressure-sensitive adhesive comprising normally solid aromatic sulfonamide-formaldehyde resin, cellulose acetate and non-volatile liquid toluene sulfonamide plasticizer compatible with resin and cellulose acetal. No. 2,426,257. Paul F. Ziegler to The Kendall Company.

Insecticidal dust composition comprising p-chloroacetophenone semicarbazone in form of impalpable powder admixed with solid diluent. No. 2,426,349. Samuel I. Gertler and Herbert L. J. Haller.

Insecticidal composition containing as active ingredient in admixture with insecticidal adjuvant esters of hydroxyphenyl trichloromethyl carbinols. No. 2,426,417. Norman E. Searle to E. I. du Pont de Nemours & Company.

Non-caking laundry sour composition in which tendency of ingredients to form hydrofluoric acid on storing is inhibited. No. 2,426,836. Lowell Russell McCoy to Wyandotte Chemicals Corporation.

Insulated conductor comprises conductor, layer of insulation surrounding conductor, layer of textile material impregnated with plastic mixture of unconverted ester gums and a semi-drying oil surrounding insulation, plastic coating. No. 2,426,858. Samuel E. Billhart and Alvin N. Gray to Western Electric Company, Inc.

Fungicidal composition consisting of 3,5 dibromsalicylaldehyde and borax. No. 2,426,864. Lloyd Crosser Felton to Hynson, Westcott & Dunning, Inc.

Composite sheet comprising layer of gelatin containing compound selected from water soluble hydroxy aliphatic monoamines and water soluble oxygen containing heterocyclic monoamines containing nitrogen in trivalent form, backing and intermediate layer containing drying oil. No. 2,426,935. Irwin Kramsky and Melville J. Holik to Ditto, Inc.

Insecticide and method of using. No. 2,427,286. William A. Knapp and Leon J. Heuser to General Chemical Company.

Heat conducting luting material comprising permanently plastic vehicle as base, comprising ingredient selected from soft petroleum resin and asphalt resin blended with non-volatile, non-drying petroleum lubricating oil, and finely divided graphite dispersed therethrough. No. 2,427,398. William C. Ferguson and Paul Sussenbach to The Presstite Engineering Company.

Starch adhesive composition comprising gelatinized cereal starch in aqueous alkali medium, compound of amphoteric metal for increasing cohesiveness of starch, and water-dispersible aliphatic long chain bi-polar organic compound. No. 2,427,562. Carl C. Kesler and David Rankin to Penick & Ford, Ltd.

## *Canadian*

Insecticide composition essentially containing N-cyclopentenyl N-cyclohexyl amine. No. 444,955. Carbide and Carbon Chemicals, Ltd. (George H. Law and John H. Purse).

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*Additional patents from the above volumes will be given next month.*


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A Checklist of Chemical and Chemical Specialties Trademarks

**432,562.** Diamond Chemical Co., Inc., Long Island City, N. Y., filed May 23, 1946; Serial No. 502,627; for bleaching compounds; since May 1, 1946.

**432,917.** The Baker Castor Oil Company, Bayonne, N. J., filed Feb. 18, 1946; Serial No. 496,758, for wax-like material derived from castor oil for finishes for soiled surfaces, for impregnating porous material, etc.; since Jan. 21, 1946.

**480,294.** The Mauston Corp., Winona, Minn., filed Feb. 27, 1945; for mineral oil compounds for removal of sludge; since May 14, 1944.

**491,428.** The Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., filed Nov. 10, 1945; for insecticides; since Mar. 19, 1945.

**500,845.** United States Rubber Co., New York, N. Y., filed Apr. 24, 1946; for hard thermoplastic rubber-resin sheet material; since Feb. 18, 1946.

**500,929.** Armour & Co., Chicago, Ill., filed Apr. 26, 1946; for methylene bis amide; since February 1945.

**500,943.** Catalin Corp., New York, N. Y., assignor to Catalin Corp. of America, Delaware; filed Apr. 26, 1946; for molding powder comprising reaction product of phenol and formaldehyde; since Sept. 14, 1944.

**501,554.** American Viscose Corp., Wilmington, Del., filed May 7, 1946; for conditioning media for yarns; since Mar. 6, 1946.

**502,783.** American Anode Inc., Wilmington, Del., and Akron, Ohio; filed May 27, 1946; for aqueous dispersions of natural and synthetic rubbers; since Feb. 12, 1946.

**502,960.** Fibrcan Corporation, New York, N. Y., filed May 29, 1946; for material or waste cans of plastic, paper or base metal; since Mar. 15, 1946.

**504,658.** Berwyn Chemical Co., Inc., Berwyn, Pa., filed June 27, 1946; for insecticides; since Nov. 20, 1945.

**507,348.** Standard Oil Company of California, Wilmington, Del., and San Francisco, Calif., filed Aug. 13, 1946; for lubricating oils and greases; since June 12, 1945.

**508,585.** Dow Corning Corp., Midland, Mich., filed Sept. 6, 1946; for thermosetting liquid cement; since February 1945.

**508,696.** American Cyanamid Co., New York, N. Y., filed Sept. 9, 1946; for cracking catalyst; since Feb. 15, 1945.

**509,257.** K. C. Working Chemical Co., Los Angeles, Calif., filed Sept. 17, 1946; for synthetic detergent; since Aug. 13, 1946.

**509,704.** J. M. Huber, Inc., New York, N. Y., filed Sept. 25, 1946; for composition for softening, tackifying, and/or inhibiting bloom in natural rubber compounds; since Sept. 18, 1946.

**510,389.** Robert H. Harkins as Nott Manufacturing Co., Mount Vernon, N. Y.; filed Oct. 7, 1946; for herbicides, insecticides, etc.; since Apr. 11, 1946.

**510,488.** Dan River Mills, Inc., Danville, Va., filed Oct. 9, 1946; for dyed cellulose ethers; since Aug. 29, 1946.

**511,527.** The Kendall Co., Walpole, Mass., filed Oct. 24, 1946; for pressure sensitive adhesive tape; since Sept. 25, 1946.

**512,086.** Pacific Coast Borax Co., New York, N. Y., filed Nov. 5, 1946; for chemical for use as fire retardant for lumber, etc.; since July 31, 1946.

**512,193.** Monsanto Chemical Company, St. Louis, Mo., filed Nov. 7, 1946; for synthetic resins; since Aug. 23, 1946.

**513,203.** Phillips Petroleum Company, Bartlesville, Okla., filed Nov. 25, 1946; for naphthas; since Feb. 9, 1946.

**513,742.** Internation Cellucotton Products Co., Chicago, Ill., filed Dec. 5, 1946; for cellulose fibre of wood pulp; since Nov. 15, 1946.

**514,394.** The American Oil Co., Baltimore, Md., filed Dec. 17, 1946; for automobile tires, tubes, etc.; since Oct. 9, 1946.

**514,771.** Ohio-Apex, Inc., Nitro, W. Va., filed Dec. 24, 1946; for plasticizers; since Nov. 8, 1946.

**514,947.** The Eagle-Picher Company, Cincinnati, Ohio; filed Dec. 28, 1946; for diatomaceous earth in natural state, calcined, flux-calcined; since Dec. 12, 1946.

**516,377.** Practical Products Co., Minneapolis, Minn., filed Jan. 25, 1947; for liquid petroleous solvents; since Apr. 22, 1943.

**518,188.** Advance Solvents & Chemical Corp., New York, N. Y.; filed Feb. 27, 1947; for modified thiocarbamate accelerator for rubber and synthetic rubber; since Jan. 10, 1943.

**518,280.** Dexter Chemical Corp., New York, N. Y., filed Feb. 28, 1947; for wetting agents, water soluble oils, etc.; since January 1946.

**518,281.** Dexter Chemical Corp., New York, N. Y., filed Feb. 28, 1947; for wetting agents, water soluble oils, etc.; since May 1946.

**518,282.** Dexter Chemical Corp., New York, N. Y.; filed Feb. 28, 1947; for wetting agents, water soluble oils, etc.; since May 1946.

**518,688.** The Mathieson Alkali Works, New York, N. Y., filed Mar. 7, 1947; for bicarbonate of soda; since Jan. 9, 1947.

**518,750.** California Spray-Chemical Corp., Wilmington, Del., and Richmond, Calif., filed Mar. 10, 1947; for parasiticides; since Feb. 7, 1947.

**519,782.** Trent Chemical Works, Inc., New Bern, N. C., filed Mar. 28, 1947; for copper naphthenate wood preservative and chemical rust remover; since Mar. 15, 1947.

**520,267.** Cook Chemical Co., Kansas City, Mo., filed Apr. 7, 1947; for insecticide; since Mar. 3, 1947.

**520,396.** Interchemical Corp., New York, N. Y.; filed Apr. 9, 1947; for moth crystals; since Dec. 23, 1946.

**521,402.** The Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., filed Apr. 26, 1947; for insecticides; since Mar. 25, 1947.

**521,405.** Polymer Chemical Co., Cincinnati, Ohio., filed Apr. 26, 1947; for adhesives; since Aug. 1, 1946.

**521,958.** Amercian Cyanamid Co., New York, N. Y., filed May 6, 1947; for wettable sulphur; since Dec. 20, 1946.

**522,402.** Refined Products Corp.; Lyndhurst, N. J.; filed May 15, 1947; for softening and finishing agent for fabric; since April 1941.

**522,756.** Woolfolk Chemical Works, Ltd., Fort Valley, Ga., filed May 21, 1947; for fungicidal spray for tobacco plant beds; since December 1946.

**522,760.** John Powell & Co., Inc., New York, N. Y., filed May 21, 1947; for insecticides; since Mar. 31, 1947.

**522,761.** John Powell & Co., Inc., New York, N. Y.; filed May 21, 1947; for fungicides; since Jan. 2, 1947.

**523,368.** Central Paint & Varnish Works, Inc., New York, N. Y.; filed June 2, 1947; for insecticides; since Jan. 15, 1947.

**523,376.** E. I. du Pont de Nemours & Co., Wilmington, Del., filed June 2, 1947; for compound to render cellulosic material flame resistant; since Apr. 25, 1947.

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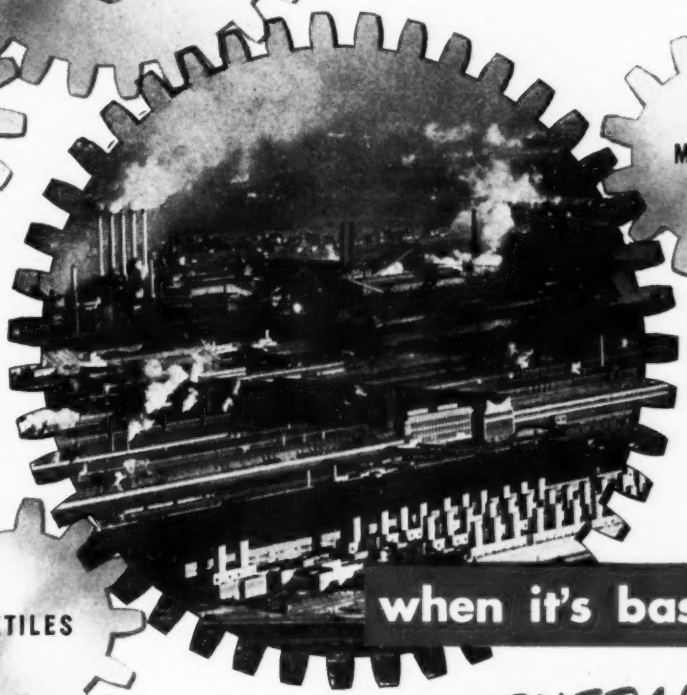

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